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ABSTRACT

The study seeks to expand the occupational information available to educators by relating job openings data to information about the earnings of persons employed in different occupations, their educational attainment, and the opportunities individual fields are expected to offer for women and nonwhites. The data refer to 123 occupations including those related to all the major federally-supported vocational programs. The report presents historical data and projections to 1980 and 1985 which are consistent with the U. S. Department of Labor's economic growth model. The data base includes published and unpublished decennial census data, current population survey reports, and Office of Education and other enrollment data. The research indicates that the vocational enrollments tend to be concentrated in programs related to occupations with median earnings below those of the overall labor force. The occupational distribution for women is projected to change slowly in the next decade with somewhat greater shifts for nonwhites. The major changes in educational attainment are expected to take place in the less skilled occupations. Vocational enrollments have become more labor market oriented. However, there is a high ratio of enrollments to anticipated job openings in the agricultural fields, and a low ratio in the health and distribution fields. Appendixes (121 pages) contain the national projections, replicability of the national projections for the states of Kentucky and New Jersey, and the statistical tables. (Author/RG)

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Leonard A. Lecht
Marc A. Matland
Richard Rosen
The Conference Board
845 Third Avenue
New York, New York 10022

CHANGES IN OCCUPATIONAL CHARACTERISTICS IN THE NEXT DECADE: THEIR IMPLICATIONS FOR PLANNING IN VOCATIONAL EDUCATION

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Abstract

This study seeks to expand the occupational information available to educators by relating job openings data to information about the earnings of persons employed in different occupations, their educational attainment, and the opportunities individual fields are expected to offer for women and nonwhites. The data refer to 123 occupations including those related to all the major federally-supported vocational programs. The report presents historical data and projections to 1980 and 1985 which are consistent with the U.S. Department of Labor's economic growth model. The data base for the study includes published and unpublished decennial census data, Current Population Survey reports, and Office of Education and other enrollment data. The research indicates that the vocational enrollments tend to be concentrated in programs related to occupations with median earnings below those of the overall labor force. The occupational distribution for women is projected to change slowly in the next decade with somewhat greater shifts for nonwhites. The major changes in educational attainment are expected to take place in the less skilled occupations. The study shows that vocational enrollments have become more labor market oriented. However, there is a high ratio of enrollments to anticipated job openings in the agricultural fields, and a low ratio in the health and distribution fields.

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CHAPTER 1

A SUMMARY VIEW

I.

Vocational education is an educational program, a manpower program, and it has taken on many elements of a social program. Labor market information, as well as educational data, accordingly, are important in planning and decision-making in vocational education. The manpower information which has received a high priority in planning in the past has been primarily concerned with future job openings and employment growth. Job openings data are often an inadequate guide in planning. The openings may exist in occupations characterized by low earnings, formidable educational requirements, or difficult-to-breach barriers to entry by women or members of minority groups. This study seeks to expand the scope of the information available to educators, employers, and others by relating the job openings data to information about other significant occupational characteristics, such as the earnings of the persons employed in different occupations, their educational attainment, and the opportunities individual fields are expected to provide for women and nonwhites. These considerations are important for students and educators, for employers and government officials concerned with job training, recruitment, and equal employment opportunity programs, and for persons generally concerned with manpower programs.

The occupational characteristics indicators refer to 123 individual occupations. They include the occupations, or clusters of occupations related to all the major federally-supported vocational programs. They also include other occupations of prospective interest to educators or others concerned with occupational preparation in nonprofessional fields. These occupations have been selected on the basis of the earnings of the persons employed in them, their projected job openings in the 1970 to 1985 period, and the educational attainment of their work force. All told, the occupations considered are expected to account for over 55 percent of the economy-wide job openings in the next decade. They are related to vocational programs which, according to U.S. Office of Education projections, will account for close to 85 percent of all enrollments in the federally-supported programs in 1977.

The relationship between the occupations considered and all occupations is summarized in Table 1-1 for 1970, the base year for the study.

Table 1-1

Comparison of Occupations Included in Study With All Civilian Occupations, 1970

Indicator	Occupations Studied	All Occupations	Occupations Studied as Percent of All Occupations
1. Distribution of Employment			
by Sex (in thousands)			
Male	27,815	48,960	57%
Female	15,585	29,667	53
by Race (in thousands)			
White	39,888	70,182	57
Nonwhite	3,511	8,445	42
by Years of Schooling (in thousands)			
Less than 12 years	16,741	29,250	57
12-15 years	23,697	39,680	60
16 years or more	2,961	9,750	30
by Occupational Group (in percent)			
Professional and technical workers	4.9%	14.2%	-
Salesworkers	10.6	6.2	-
Craftsmen	19.0	12.9	-
Laborers, except farm	1.5	4.7	-
2. Median Earnings 1/ (in 1973 dollars)	$8,725	$9,945	88

1/ Full-year workers only.

The occupations considered in the study include a somewhat greater proportion of males than females, and a considerably greater percentage of whites than nonwhites. There is a smaller representation of professional and technical workers than in the overall labor force, and a larger proportion of craftsmen and salesworkers. College graduates are conspicuously underrepresented because of the choice of occupational fields. The median earnings of full-year workers in the 123 occupations in 1970 was an eighth less than the comparable earnings for the entire employed civilian labor force.

The overall findings which emerge from the study are summarized below:

1. About two-thirds of the job openings in the occupations considered in the 1970 to 1985 period are expected to arise from the replacement of attrition losses, and only one-third from employment growth. While many of the attrition-generated openings will represent opportunities to replace experienced and skilled workers, the bulk of the replacement demand will occur in less well-paid fields with a majority of female employees.

2. The vocational education system typically prepares persons for employment in fields which pay less than the median earnings for all occupations. In 1970, about two-thirds of the full-year workers in the occupations studied earned less than the median for all full-year workers.

3. If the trends of the past fifteen years continue, the nation's commitment to equal employment opportunity will be accompanied by only modest changes in the occupational distribution for women and somewhat greater changes for nonwhites. As the largest of the publicly-supported occupational training programs, the vocational education system is strategically situated to prepare more women and nonwhites for desirable careers in fields in which they have been poorly represented in the past.

4. The concentration of employment in occupations yielding low incomes is especially marked for women and nonwhites. Three-fourths of the women, and over half of the nonwhite full-year workers in the occupations studied had earnings in 1970 which were approximately $2,000 or more below the national median for full-year workers.

5. While there will be many more college graduates in 1985 than at present, the more widespread changes are expected to stem from the sharp decline in the proportion of employed persons with less than 12 years of schooling. The reduction in the representation of "drop-outs" is projected to be greatest in the less skilled occupations in which they have traditionally been concentrated.

6. Although the vocational education system has become more labor-market oriented in its planning there are still significant divergences between the job openings and vocational enrollments anticipated in the next decade. There is a far larger proportion of enrollments than job openings in the agricultural field, and a considerably lesser proportion of enrollments than jobs in the health and distribution fields.

7. Demographic changes in the next decade can be expected to lessen the importance of the high school age group as the primary audience for vocational programs, and to increase the importance of adults with labor force experience as the source of enrollment growth. As one indication of the dimensions of this demographic shift, the population of 14 to 24 year olds is projected to decline by 3.2 million between 1980 and 1985.

8. It is feasible to prepare most of the occupational characteristics indicators presented nationally for individual states or the larger Standard Metropolitan Statistical Areas. However, because of the smaller population base and sample size, considerations of statistical reliability limit the degree of detail which can be provided in these estimates.

The occupations individuals choose have a major bearing on their income, their likelihood of becoming unemployed, and their opportunities for self-realization. Occupational choices, in turn, can influence the economy's growth by contributing to the development of manpower surpluses which add to unemployment or to manpower bottlenecks which raise employers' costs. The information provided to students about occupations or used in educational planning must encompass the range of considerations which are relevant in making occupational choices. The information presented in this study can provide a first step in developing and improving a series of occupational characteristics indicators to supply a more comprehensive overview of anticipated changes influencing the transition from school to work.

II.

The changes in occupational characteristics projected for the 1980's reflect the economic, demographic, and social framework anticipated in 1980 and 1985. The strategic variables in this framework are summarized in Table 1-2 which follows.

Table 1-2

Selected Economic and Social Framework Variables, 1970 and Projected 1980 and 1985

Variable	1970	1980	1985	Average Annual Growth Rate 1970 to 1980	 1980 to 1985	 1970 to 1985
Population, 14 and over (in millions)	151.1	174.7	182.9	1.5%	0.9%	1.3%
Civilian labor force (in millions)	82.7	99.8	105.7	1.9	1.2	1.7
Civilian employment (in millions)	78.6	95.8	101.5	2.0	1.2	1.7
Unemployment rate	4.9%	4.0%	4.0%	-	-	-
Gross National Product (in billions of 1973 dollars)	$1,115	$1,751	$2,051	4.6	3.2	4.2
Gross National Product per worker (in 1973 dollars)	$13,625	$17,900	$19,820	2.8	2.1	2.5
Average annual hours per worker 1/	1,968	1,920	1,888	-0.3	-0.3	-0.3

1/ Private economy only.

Sources: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Department of Commerce, Bureau of the Census. Population projections based on Series E fertility assumption.

Occupational choices in the next decade will be made in an environment in which the labor force is expected to grow slowly. For example, the labor force increased by nearly two percent a year between 1968 and 1972, and a growth rate of this dimension is projected to continue in the 1970's. However, labor force growth is expected to decrease to a 1.2 percent annual rate in the 1980 to 1985 period because of declining birth rates 15 to 20 years earlier. The consequences of a slower growth in the number of persons available to produce goods and services show up in the anticipated slowing down of the GNP growth rate from an estimated 4.6 percent annually in the 1970's to a 3.2 percent average annual rate in the first half of the 1980's.

The slowly growing labor force in the next decade will reap the benefits of continuing technological change and productivity growth. These developments will frequently eliminate specific jobs or reduce the numbers employed in them, or change their duties and skill content, while in other instances, they will encourage the development of new occupations. The emergence of the computer programmer in the past two decades and the changes in employment in the printing trades are instances. Using growth in GNP per worker as a proxy for productivity increase, productivity is expected to grow at an average annual rate of 2.5 percent a year in the 1970 to 1985 period. The productivity gains, together with changes in the occupational distribution of the work force, supply the basis for an anticipated increase in the earnings of full-year workers from $9,945 in 1970 to about $15,000 in 1985 (in 1973 dollars). Given the choice between larger earnings and more leisure, it is expected that, as in the past generation, Americans will assign a higher priority to earnings than to leisure. Accordingly, annual man-hours per worker are projected to decrease only modestly, by an average of 0.3 of 1 percent a year. Over the entire 15 year period, however, this gradual decrease would represent the equivalent of an additional two weeks of leisure a year. As in the past, it is anticipated that the bulk of the reduction in hours will be taken in the form of more widespread and longer vacations rather than in reductions in the weekly hours of work.

The productivity gains, and their consequences for manpower utilization, are likely to be unevenly distributed between economic sectors. The gains in agriculture, for example, are projected to amount to double the average rate for the overall private economy. Slow growth in farm output coupled with continued high productivity increases are the basis for the anticipation that the farm occupations will constitute the one group in which employment is projected to decline, a decline estimated at almost a million between 1970 and 1985. The diminished share of the economy's output represented by agricultural products will also set limits to growth in the broad spectrum of agri-business occupations.

The projections of population and labor force increase, productivity growth, GNP, and employment are consistent with the economic framework utilized in the U.S. Department of Labor's Bureau of Labor Statistics employment projections. 1/ The basic employment and attrition estimates

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1/ See U.S. Department of Labor, Bureau of Labor Statistics, The U.S. Economy in 1985, Bulletin 1809, 1974.

are also derived from Bureau of Labor Statistics sources. These estimates imply an unemployment rate of 4 percent in 1980 and 1985. This is a lesser rate than has been attained in the first half of the 1970's, and a substantially lesser one than the greater-than-8 percent figure expected for 1975. Changes in the makeup of the labor force will make it more difficult to attain a 4 percent rate in the next ten years than a decade earlier because of the greater representation of the more unemployment-prone groups, such as nonwhites or women in the work force. The restraints exerted on economic policy by fears of stimulating inflationary pressures can also be expected to compound the difficulties involved in attaining a 4 percent unemployment rate in the next ten years. A higher unemployment rate than the one incorporated in the projections would reduce the job openings in most occupations to levels lower than those indicated in the projections, and lead to more modest changes in the representation of women and nonwhites in the better paying fields than are shown in the projections. Slow growth and persistent high unemployment levels would also hasten the shift of college graduates into fields in which they have been reluctant to enter in large numbers in the past. It is impossible to predict what the unemployment rate will be five or ten years from now, and the projections of job openings must rely on assumptions about the economy's potential for a non-inflationary minimum unemployment level in the coming decade. The significance of these assumptions is that they underscore the importance of a dynamic economy as a critical variable in educational as well as manpower or business planning.

III.

Three elements characterize the job openings in the fields considered in the study. One is the predominance of white-collar jobs in occupations which typically employ persons with some job skills but less than four years of college. Another is the importance of replacement demand as a source of job openings. The third is the concentration of earnings for persons employed in these occupations at levels below the median for the overall work force.

The 123 occupations included in the study are expected to generate an annual average of 2.75 million job openings in the 1970 to 1985 period. Three-fifths of the openings are projected to occur in white-collar fields. The distribution of the job openings by occupational group is described in Table 1-3.

Table 1-3

Projected Average Annual Job Openings, 1970 to 1985
(in thousands)

Occupational Group	Projected Average Annual Job Openings, 1970 to 1985
Professional and technical workers	204.0
Managers and administrators, except farm	344.2
Salesworkers	316.5
Clerical workers	794.7
Craftsmen and foremen	342.1
Operatives	307.5
Service workers	428.8
Laborers, except farm	20.3
Farm occupations	-
All Occupations	2,753.0

Note: Details may not add to total due to rounding.

The largest single group of job openings listed in the table are for clerical workers, a field overwhelmingly made up of female employees. The next largest are in a variety of more or less skilled service fields including personal services, health services, and protective services. No figure is listed for the farm occupations since employment decline in this occupational group is expected to outweigh the replacement of attrition losses leading to a meaningless negative number for job openings.

Slightly more than 900,000 of the job openings anticipated annually between 1970 and 1985 are estimated to arise from employment growth, and the remainder, about 1.8 million, from the replacement of attrition losses. Individual occupations differ markedly in the relative importance of growth as compared with attrition. For example, three-fourths of the openings for engineering and science technicians, excluding subcategories listed separately, are expected to arise from employment growth. Nearly 80 percent of the projected openings for bookkeepers, to cite another instance, are projected to come about because of attrition. The occupations in which replacement demand dominates job openings tend to have a high representation of women who leave the labor force, at least temporarily, to rear children, and who usually retire at a younger age than men. High replacement demand is also characteristic of slow-growth occupations, including a number of skilled crafts. Employment growth is typically the dominant element in new occupations, in occupations concentrated in rapidly growing industries, often public service industries, and in fields heavily influenced by technological advance. The fields in which the job openings are dominated by employment growth, especially the technical fields, include many of the better-paid occupations in which the earnings of full-year workers approximate or exceed the economy-wide median.

While a number of the occupations characterized by rapid employment growth frequently yield earnings greater than the overall median, close to two-thirds of the persons employed in the occupations studied who were full-year workers in 1970 earned less than the $9,945 median earnings (in 1973 dollars) for all full-year workers. Over two-fifths of the full-year workers in these fields earned $2,000 or more below the economy-wide median while only a fifth earned at least $12,000, approximately $2,000 more than the national average.

The distribution of employment by earnings in the occupations considered is described in Table 1-4.

Table 1-4

Distribution of Employment in Occupations Studied
Grouped by Median Earnings of Full-Year Workers, 1970

Occupations With Median Earnings of:	Percent Distribution of Employment
Less than $6,000	12.3%
6,000 - 7,999	29.1
8,000 - 9,999	23.8
10,000 - 11,999	14.7
12,000 - 13,999	7.8
14,000 and over	12.4
Total	100.0

Note: Details may not add to total due to rounding.

Women and nonwhites are frequently overrepresented in the occupations which pay substantially less than the national median. Low earnings are also characteristic of many slowly growing fields. These poorly paid occupations have often become relatively less well paid in the recent past as economic progress and productivity increases have led to more substantial increases in other fields. The median earnings for sewers and stitchers who worked a full year in 1970, for example, amounted to just under $4,900. This represented a decline from 58 percent of the national median for year-round workers in 1960 to 49 percent in 1970. Employment in some lowly-paid fields, often human service occupations, is projected to increase rapidly in the 1970 to 1985 period. For instance, the median earnings for full-year health aides in 1970 was about $5,440. Employment in this occupation is expected to more than double in the 1970 to 1985 period.

The better-paid occupations included in the study, those paying more than $12,000 a year for year-round workers in 1970, include semi-professional fields, such as personnel workers and draftsmen, occupations related to finance and real estate, and a number of skilled craft and technician fields. Aside from the preponderance of white male representation in these occupations, they are also characterized by the high level of educational attainment of the persons employed in them. For example, only about a fourth of the employees in the occupations in the $12,000 and over group had finished less than 12 years of schooling and 15 percent had completed 4 or more years of college. At the other end of the occupational spectrum, in the fields in the less than $6,000 group, nearly three-fifths of the persons employed in them had completed less than a full high school education.

Economic growth and productivity gains are expected to increase earnings in virtually all occupations, an increase represented by escalation in the median earnings of full-year workers to approximately $15,000. Growth is likely both to move up and increase the range of earnings in the occupations included in the study. The upgrading of earnings is expected to be especially significant in managerial and semi-professional fields, and in technical occupations and skilled crafts, such as airplane mechanics.

The earnings data reflect the exclusion of the many professional occupations requiring at least four years of college for admission. They also reflect the widespread attitude that vocational education is education for "other people's children." 1/ Accordingly, with many individual exceptions, the vocational programs have tended to cluster around the less well-paid occupations in our society.

1/ U.S. News and World Report, October 13, 1968, p.45.

While economic and social mobility have come to be widely identified with a college education, the most striking change in educational attainment in the occupations considered is the sharp decline in the proportion of persons in the less skilled occupations with under twelve years of schooling. This change can be expected to outweigh the increase in the representation of college graduates in the largely nonprofessional fields included in the study. The greater supply of better-educated persons, especially young persons, is likely to reduce the scarcity value and, accordingly, the economic return to the possession of educational credentials.

The changes anticipated in the level of educational attainment for the persons employed in the occupations studied are described in Table 1-5.

Table 1-5

Distribution of Educational Attainment, 1970
and Projected 1985, Occupations Included in Study

Percent of Workers Completing:	1970	1985
Less than 12 years	38.6%	22.8%
12 to 15 years	54.6	68.1
16 years or more	6.8	9.1

The percentage of persons in the study occupations with less than 12 years of schooling is expected to decline by close to 16 percentage points in the 1970 to 1985 period. This marked upgrading in educational attainment is concentrated among blue-collar and service workers. The upgrading is consistent with the increase in the educational attainment level of the overall labor force in the past decade. For example, between 1964 and 1974 the median number of years of schooling completed by all persons in the employed civilian labor force rose only from 12.2 to 12.5 years. The comparable median for blue-collar workers rose from 10.7 to 12.1 years. 1/ For the 123 occupations included in the study, the upgrading of educational attainment in less highly skilled fields is illustrated by the service workers group. In 1970, close to half, 46.5 percent, of the service workers had less than 12 years of schooling. By

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1/ Manpower Report of the President, 1975, p. 269.

1985, this proportion is estimated to fall to less than three-tenths, to 29.5 percent.

The upgrading of educational attainment in nonwhite-collar fields is most apparent among young workers, the age group which includes the bulk of the new entrants into the labor force. In all of the occupations studied, in only five was the percentage of workers in the under 35 age group with less than 12 years of schooling as great as the proportion of all workers in this educational category in the occupation. The significance of the age differential is illustrated for males by farm owners and tenants, and, for females, by practical nurses. In 1970, almost three-fifths, 57 percent, of all farm owners and tenants had less than 12 years of schooling. The corresponding percentage for the under 35 year group was slightly over a fourth, 27.6 percent. Three-tenths of all practical nurses had less than 12 years of schooling. Only about one-tenth of the under 35 practical nurses were in the same educational attainment group.

The upgrading of educational attainment in the less skilled occupations has many ramifications for schools, for employers, and for the quality of life. The less skilled, more poorly paid, and generally less desirable occupations in the past had drawn their labor supply from persons with limited educational credentials. In the next decade the labor pool they will draw on will contain a proportion of high school graduates approximating the representation of high school graduates in more skilled fields. In addition, many more young people will have completed high school and be available to enroll in post-high school programs on a full or a part-time basis, a change likely to markedly increase the importance of post-secondary vocational education.

The authoritarian factory discipline, exemplified in the automobile assembly line of an earlier period, is likely to become less acceptable than it was in an earlier generation to a work force including a majority who have completed high school and frequently some college as well. A major ingredient underlying the recent concern with alienation from work, and the consequences of this alienation for productivity growth, has been the increase in educational attainment among the younger members of the industrial labor force. [1]

Recent studies suggest that the importance of a four-year college degree as the entrance requirement to middle class status will become less important in the next decade than in the past one. The studies show, for example, that the percentage of male new high school graduates going on to college has been diminishing. For instance, this proportion declined from 63 percent in 1968 to 50 percent in 1973. A major element underlying the shift has been a falling-off in the economic return from attending college. The falling-off is illustrated by a drop in the ratio of the income of college graduates to high school graduates in the 25 to 34 age group from 1.39 to 1 in 1969 to 1.23 to 1 in 1973. The drop has been widely interpreted as a response to changes in market forces stemming from a more rapid increase in the supply of college graduates than in the demand for workers in the professional and managerial fields which college graduates have typically entered in recent decades. 1/

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[1] For an analysis of this problem, see: Levitan, S.A., and Johnson, William B., Work is Here to Stay, Alas, Olympus Publishing Co., 1973; U.S. Department of Health, Education, and Welfare, Work in America, 1972.

It is unclear at present how much of the diminished attractiveness of the college degree represents a short-term response to the recession and high unemployment rates in the past few years, and how much represents a response to long-term economic and demographic changes. Declining enrollments in elementary and secondary schools underscore a reduction in opportunities for teachers in these fields which is likely to continue for the next ten years. The fluctuations in demand for engineers, on the other hand, mainly stem from changes in business conditions and shifts in national priorities, i.e., the lesser priority assigned to the space program in the 1970's. For the coming decade, student reactions to a continued decline in the economic return from attending college can be expected to show up in two ways. One is a lesser rate of increase, or a decrease, in the number of college enrollments. The other is a greater representation of the college-educated population in occupations in which fewer college graduates had been employed in the past. The projections, reflecting the experience of the past ten or fifteen years, show only a modest percentage increase in the overall representation of college graduates in the occupations studied, an increase from under 7 percent in 1970 to slightly over 9 percent in 1985. The increase is expected to be concentrated in fields in which there is already a sizeable proportion of persons with higher education. Bank officials, stock and bond salesmen, or specialized computer programmers are instances.

For the vocational education programs, a significant by-product of the slowing down of college enrollment growth will be the greater numbers of students with good learning ability who could be candidates for high school and post-high school vocational programs. In addition, in many semi-professional, managerial, and technical fields, the vocational graduates will be competing with the larger number of college graduates seeking to enter the same fields. These developments suggest potentials for upgrading programs as the response of the vocational education systems to the lesser economic return to college attendance.

1/ Freeman, Richard B., "Overinvestment in College Training," The Journal of Human Resources, Summer, 1975.

V.

Our society is committed to expanding employment opportunities for women and nonwhites through legislation, education, and affirmative action programs by employers. The historical record for the past ten or fifteen years shows many instances of breakthroughs into new occupational fields by women and, somewhat more so, by nonwhites. Yet, if the trends of the recent past continue through the mid 1980's, the erosion of the barriers which frequently bar women or nonwhites from the more desirable job opportunities will proceed at a slow pace. The projections raise questions about the role of the vocational education system, as well as the role of government or employers, in breaking down the traditional stereotypes of "men's jobs" and "women's jobs" or in enlarging career prospects for blacks and other minority group members included in the Census "nonwhite" classification.

Women and nonwhites will make up a more rapidly growing component of the labor force than men or whites in the coming decade. The rate of labor force growth is expected to be considerably more rapid for nonwhites than for women. These changes are described in Table 1-6.

Table 1-6

Projected Changes in the Civilian Labor Force by Sex and Race, 1970 to 1985
(in thousands)

	1970	1985	Percent Increase, 1970-1985
Total Civilian Labor Force	82,715	105,716	27.8%
Distribution by Sex			
Male	51,195	64,057	25.1
Female	31,520	41,659	32.2
Distribution by Race			
White	73,518	92,355	25.6
Nonwhite	9,197	13,361	45.3

Source: Manpower Report of the President, 1975, pp. 206, 207; 1985 projections are Conference Board estimates.

Since women and nonwhites will make up a larger share of the labor force in 1985 than in 1970, members of these two groups would be more heavily represented in most occupations even if there were no changes in the kinds of jobs they held. Accordingly, in the coming decade measures which enlarge the opportunities open to members of the two groups will affect substantially more people, and a larger segment of the work force. Similarly, the economic, political, and social consequences of the persistence of discriminatory barriers will be more widespread than would have been the case in earlier periods when fewer persons were affected by these practices.

Women and nonwhites share similar problems in the labor market. Their unemployment rates are higher than those for men or whites. In 1974, to cite some recent history, the unemployment rate for women was 6.7 percent as compared with 4.8 percent for males, and the corresponding percentages by race were 9.9 percent for nonwhites and 5 percent for whites. 1/ Because of their concentration in lower paying occupations, members of the two groups who work for a full year earn considerably less than whites or males. Table 1-7 summarizes the earnings data by sex and race for persons who worked at least 50 weeks during the year in 1970 in the 123 occupations included in the study.

Table 1-7

Comparison of Sexual and Racial Distribution of Employment in Occupations Studied Grouped by Median Earnings of Full-Year Workers, 1970

Occupations With Median Earnings of:	Percent Distribution of Employment, 1970 Male	Female	White	Nonwhite
Less than $6,000	5.3%	24.7%	10.8%	29.2%
6,000 - 7,999	16.8	51.0	29.5	24.4
8,000 - 9,999	29.6	13.6	23.4	28.6
10,000 - 11,999	21.1	3.2	15.1	9.6
12,000 - 13,999	10.2	3.3	8.1	3.9
14,000 and over	17.0	4.2	13.2	4.3
Total	100.0%	100.0%	100.0%	100.0%

Note: Details may not add to total due to rounding.

Three-fourths of the women and over half of the nonwhite full-year workers in 1970 were employed in occupations which paid about $2,000 or more below the economy-wide median for all year-round workers. Only 7 to

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1/ Manpower Report of the President, 1975, p. 230.

8 percent of the women or nonwhites were at work in fields which paid $2,000 a year or more than the median. Nonwhites fared somewhat better in their earnings record in the occupations considered than women. For instance, more than half the women but only about one-fourth of the nonwhites were employed in one of the low-paying groups, the $6,000 to $8,000 group. The predominance of women in the under $8,000 group was more than 3 and 1/2 times that of men while the proportion of nonwhites in this group was 1.3 times greater than the comparable figure for whites.

The ten lowest paying occupations among the 123 studied include many service fields, some operatives occupations, and farm laborers. Nonwhites made up slightly less than 10 percent of the total civilian employed labor force in 1970. They constituted more than 11 percent of the work force in eight of these ten fields. Women represented about three-eighths of the employed civilian labor force. They made up five-eighths or more of the persons employed in 9 of the ten fields. Much of the low-earnings record of women is attributable to the high concentration of their employment in clerical fields, a white-collar group, rather than in the least skilled occupations. Forty-one percent of the women employed in the occupations considered were at work in clerical occupations in 1970 as compared with 6 percent for men. Greater-than-average educational attainment levels in clerical occupations are often associated with low earnings. For example, more than 90 percent of the secretaries employed in 1970 had completed high school or had some college education. Yet, the median earnings of secretaries who worked a full year were slightly less than $6,900 (in 1973 dollars), or about $3,000 less than the economy-wide median. Barriers to entry in better-paying occupations probably depress earnings in the occupations in which women or nonwhites are heavily represented by increasing the supply of persons seeking work in these fields.

There have been many breakthroughs in individual fields for women and nonwhites, and it is reasonable to anticipate that the breakthroughs will continue and accelerate in the decade ahead. More women are entering finance, managerial and real estate fields while nonwhites are entering managerial, technical, and other white-collar occupations in larger numbers than ever before. About a sixth of bank officials and a third of real estate brokers, for example, were women in 1970. The representation of women in the two fields is projected to increase to about a fourth for bank officials and well over two-fifths, 45 percent, for real estate brokers by the mid 1980's. The changes in the occupational representation of nonwhites are expected to be more extensive, in part, because of the more rapid labor force growth projected for nonwhites. To cite instances, the percentage of nonwhites employed as retail salespersons is expected to grow from 4.4 to 6.9 percent of the total, while the increase listed for scientific and engineering technicians is from about 5 to 9 percent.

Offsetting these evidences of changes is a mass of data showing that the scope of the breakthroughs have typically been limited. This implies that if educational and employment practices continue changing in the next decade at a pace similar to the past one, the shifts in the occupational distribution in the 1970 to 1985 period will generally be modest.

For instance, 41 percent of the women in the occupations studied were employed as clerical workers in 1970. This is projected to grow to 42 percent by 1985. In 1970, about a fifth, 22 percent, of the nonwhites were at work in service fields. The comparable percentage for 1985 is 21 percent. The major change indicated in the projections is the sharp dropoff in the anticipated representation of nonwhites in two declining fields, the farm occupations and in laborers' jobs.

Many of the significant developments in the affirmative action programs have taken place in the past few years. The 1972 Equal Employment Opportunity Act Amendments, or the EEOC guidelines on discrimination because of sex under Title VII of the Civil Rights Act, are instances. There is little evidence from the most recent and comprehensive data, the Current Population Survey reports for 1974, that these shifts have yet been substantially reflected in the pace of change in the occupational distribution for women or nonwhites. Continuing the experience of the 1960 to 1970 decade, the changes have been greater for nonwhites than for women. To cite instances, 99 percent of all secretaries were women in 1974, a proportion substantially identical with 1970. As in 1970, women made up four-fifths or more of the work force in the lowly-paid health service occupations. 1/ However, illustrating the continued shift of nonwhites into white-collar fields, the percentage of blacks and other minority group members who were employed in all types of clerical work rose from 8.1 to 9.4 percent, a differential too large to be accounted for by sampling fluctuations.

By 1985, there are expected to be nearly 50 million women and male nonwhites in the labor force. The implications of the modest expansion in career opportunities indicated by the recent shifts in occupational representation, or the projections for 1985, point to a gap between aspirations and reality. Our aspirations stress increasing opportunities by substantially lessening, if not removing, discriminatory barriers based on sex or race. The reality is that the shifts have been slow, somewhat more so for women and less so for nonwhites. The remedial measures to hasten the pace of change will involve the schools, and especially the vocational education and guidance systems. However, the long-term prospects for training more women or nonwhites to prepare for more desirable job opportunities in new fields will be bounded by the willingness of employers to hire the graduates of the programs in fields related to their training.

1/ "Employment Data for Detailed Occupations, 1974," Employment and Earnings, June 1975. Figures cited refer to all clerical occupations including those not receiving consideration in study.

VI.

The 1968 Amendments to the Vocational Education Acts, like its predecessors, assigns a high priority to the goal of "providing ready access to vocational training...which is realistic in the light of the actual or anticipated opportunities for gainful employment." The historical data and the projections show that the relationship between enrollments and job opportunities is often a loose one suggesting that the vocational programs, especially in high school, serve a variety of exploratory and educational interests in addition to occupational training. The emphasis on "gainful employment" in the Amendments underscores the importance of a greater concentration on earnings in the occupations prepared for in program priorities and planning. Greater concern with earnings would lessen the tendency to enroll students, especially women, in programs leading to employment in poorly-paid fields. Looking ahead, demographic changes and social pressures imply that the vocational programs in the next decade will include a smaller proportion of young persons preparing to enter the labor market and a larger representation of adults with work experience.

The relationship between enrollments in the major program areas and the anticipated job openings provides an overall measure of the responsiveness of the vocational education system to changes in job opportunities. Table 1-8 relates the U.S. Office of Education enrollment projections by major area in 1977 to the expected average annual job openings in the 1970 to 1985 period.

Table 1-8

Comparison of Projected Vocational Education Enrollments in 1977 With Average Annual Job Openings, 1970 to 1985, Occupations Included in Study

Program Area	Distribution of Enrollments in 1977 1/	Distribution of Average Annual Job Openings, 1970 to 1985
Agriculture	9.1%	0.6% 2/
Distributive education	8.7	25.2
Health occupations	3.9	9.5
Home economics (gainful)	5.9	5.4
Office occupations	31.0	29.2
Technical occupations	1.8	2.0
Trades and industry	39.6	23.3
Other	-	4.8
Total	100.0%	100.0%

1/ Source: Derived from U.S. Office of Education, Trends in Vocational Education, Fiscal Year 1972, Vocational Education Information, No. II, 1973. The enrollment data refer to programs related to the occupations included in the study.

2/ The figure listed for job openings related to agricultural programs in this table differs from the entry listed for farm occupations in Table 1-3 because it includes several other occupations directly related to agriculture, such as farm implement mechanics. The occupations included are derived from U.S. Bureau of Labor Statistics, "Matching 1970 Census-Based BLS National-State Matrix Occupational Categories to Office of Educational Instructional Programs," (unpublished), 1974.

Note: Details may not add to total due to rounding.

By 1977, according to the U.S. Office of Education's estimates, the enrollments in areas other than agriculture, distributive education, and health should be roughly consistent with the job openings anticipated in related fields. The enrollments in distributive education and health, while they have been increasing, would still fall short of the projected job openings in these fields. As in the past, the major inconsistency between enrollments and job openings occurs in the field of agriculture. The percentage of total enrollments in agriculture would be 15 times the proportion of the expected job openings in the fields that primarily make use of agricultural competencies. As in other program areas, and probably more so, vocational programs in agriculture serve as preparation for a family of occupations that are more or less closely related to the training offered. Including the jobs in closely related agribusiness fields, such as servicing, or buying and selling equipment and supplies to farmers, would raise the proportion of agriculture-related jobs from 0.6 percent of the total to 1.5 percent. This change would be insufficient to affect the substance of the enrollment-job openings differential. The magnitude of the differential suggests that, as in home economics, only a small part of the enrollment in the agricultural programs represents specific occupational preparation. Distinguishing between the agricultural programs which are intended as specific occupational preparation and those which contribute to other educational values or constitute a general introduction to the world of work would go far toward narrowing the large discrepancy between enrollments and career opportunities. Since agriculture is the one major field in which employment is projected to decline, this distinction would also highlight the importance of expanding the range of vocational training options available to young people in the rural areas.

Vocational training which is realistic in the light of the expected job openings serves a limited social purpose if the occupations trained for provide little better than a poverty income to the persons employed in them. For example, health aides, other than nurses aides, reported median earnings for full-year workers in 1970 of $5,440 (in 1973 dollars) while nurses aides earned approximately $4,900. The poverty income level for a four-person family in 1970, again in dollars of 1973 purchasing power, was about $4,550. In the past, vocational training and other publicly supported programs trained persons for employment in these fields as part of the "new careers" movement emphasizing preparation for employment in paraprofessional human service occupations related to health, education, and social welfare. Low earnings and absence of job security for the persons employed in them has been a common feature of many of the "new career" occupations. In these instances, concentration on job openings with limited consideration given to earnings has facilitated the establishment of programs more likely to perpetuate low incomes than to provide an escape from them.

Like concentration on the gross number of job openings, emphasis on gross enrollments obscures many important policy and planning issues in vocational education. In particular, the gross figures overlook the characteristics of the persons enrolled in the programs, including the distribution of the enrollments by sex and race. 1/ Data on enrollments

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1/ Lecht, L.A., Evaluating Vocational Education - Policies and Plans for the 1970's, 1974, p. 21.

by race in individual program areas is generally unavailable. Recent studies report that the proportion of black males who had enrolled in high school vocational programs was similar to the percentage of white males in these programs, slightly less than a sixth. Data showing the distribution by sex in the major program areas is presented in Table 1-9. The table shows the actual enrollments in 1971 and the Office of Education enrollment projections for 1977.

Table 1-9

Distribution of Enrollment by Sex, Major Vocational Program Areas, 1971 and Projected 1977

	Percent Distribution of Enrollment			
	1971		1977	
Program Area	Male	Female	Male	Female
Agriculture	96%	4%	92%	8%
Distributive education	55	45	54	46
Health occupations	12	88	17	83
Home economics	7	93	10	90
Office occupations	25	75	25	75
Technical occupations	92	8	91	9
Trades and industry	89	11	87	13
Total	44	56	43	57

Source: U.S. Office of Education, Trends in Vocational Education, Fiscal Year 1972, Vocational Education Information, No. II, 1973.

The enrollment data indicate that the distribution of enrollments by sex follows the distribution of jobs. Five-sixths of the enrollments in the health field are female, to cite an instance, while women make up only about a tenth of the enrollments in the technical and trades and industry programs. The changes anticipated in the 1971 to 1977 period show some modifications at the extremes. Slight declines are projected in fields in which women predominate, i.e., health occupations, and modest increases in fields in which women have been poorly represented, the trades and industry area for example. The historical data and the projections make it evident that the main drift of the vocational programs has been to maintain the existing pattern of "men's jobs" and "women's jobs." In part, this emphasis reflects the fear that training large numbers of young women for positions which, on the basis of past experience, may not materialize runs the risk of endowing the individuals trained with unutilized skills and frustrated aspirations. While the vocational education systems, by themselves, cannot resolve the problems stemming from discrimination in the labor market, recognition of the implications of the present distribution of enrollments can constitute an important first step in planning to do more than extrapolate the experience of the past into the future.

Planning and goal setting in education, including vocational education, in the 1960's and early 1970's took place in an environment characterized by growth in enrollments, in facilities, in finances, and in expectations. Much of this growth stemmed from a "one-time" rapid increase in the size of the basic high school and college population, the 14 to 24 year age group. Because of the decline in birth rates in the recent past, growth in this age group will slow down in the 1970's and then decline in the 1980's. Table 1-10 summarizes the expected shifts in population, by broad age groups, in the 1960 to 1985 period.

Table 1-10

Population Growth in Selected Broad Age Groups, 1960, 1970, and Projected 1980 and 1985 (in millions)

	Age Group		
	14 to 24	25 to 44	45 years and over
Population			
1960	27.3	47.1	52.9
1970	40.5	48.4	62.1
1980	44.9	62.3	67.5
1985	41.6	72.0	69.3
Growth in Population			
1960 to 1970	13.2	1.3	9.2
1970 to 1980	4.4	13.9	5.4
1980 to 1985	-3.3	9.7	1.8

Source: U.S. Department of Commerce, Bureau of the Census.

The population in the 14 to 24 age group increased by over 13 million between 1960 and 1970. This was about as large as the increase in the 14 to 24 group in the preceding 70 years. Growth for this age group is expected to taper off by two-thirds during the 1970's, and growth would be followed by a decline of more than 3 million between 1980 and 1985. The 25 to 44 year age group, a group which increased by only about a million during the 1960's, is projected to increase by 23.6 million between 1970 and 1985.

The demographic shifts indicate that the vocational programs will grow slowly, or decline, if they continue seeking in much their present form to appeal to a student population similar to that served in the past two decades. The prospects for continued growth will lie in appealing to new groups including many persons who are no longer full-time students. Part of this growth could come from drawing in more women or nonwhites or attracting a substantial part of the student body who in an earlier decade had gone on to college. New programs for adults will supply much of the growth potential, a potential underscored by the projected increase in the 25 to 44 year age group. Likely prospects include married women seeking to reenter the labor market, unskilled workers attempting to upgrade their work skills, or older persons planning to embark on a second career. The appeal to these new groups of prospective students will be more successful if the programs available are concerned with meeting emerging manpower bottlenecks anticipated by employers, if they can realistically improve earnings, and if they contribute to the overall economic development programs, including manpower programs, undertaken by states and by local communities. Looking ahead, the demographic projections, like the manpower indicators, stress a larger role for vocational education as part of "lifetime learning" and a lesser role for the traditional schooling for the young.

CHAPTER 2

EMPLOYMENT, JOB OPENINGS, AND EARNINGS

The job openings projections for the occupations included in the study show that two-thirds of the job opportunities in the 1970 to 1985 period are expected to represent replacements for experienced workers, including poorly paid health service and clerical workers and highly skilled and well paid craftsmen and technicians. Over half of the replacement demand will occur in ten occupations in which women make up a majority of the work force. Less than a third of the persons employed in the occupations studied were at work in fields in which the earnings of full-year workers in 1970 were at or above the median earnings for all year-round workers in that year. Eliminating the influence of replacement demand and concentrating on employment growth alone makes it apparent that rapid growth will take place both in many well paid and in poorly paid occupations. However, these considerations based on national projections obscure the developments affecting career opportunities in the coming decade because they overlook the marked divergences anticipated in regional patterns of economic and employment growth.

The job openings and earnings indicators for the 123 occupations are projections of past trends which have been modified in the light of recent experience. The basic employment, attrition, and productivity estimates are derived from U.S. Department of Labor sources. 1/ They are substantially influenced by the expected slowing down in labor force growth and productivity and, consequently, slow growth in GNP in the 1980's. These changes, in turn, stem from the anticipated decline in the number of younger workers in the 1980's coupled with a continued shift toward a more service-oriented economy.

Although the occupations considered generally exclude fields in which a majority of the work force possesses a four-year college degree, they include a large proportion of the economy's professional, technical, and managerial workers. Growth in the representation of white-collar and service employment in the study occupations and the decline in farm and blue-collar jobs between 1970 and 1985 is expected to parallel the changes taking place in the employment distribution for the overall economy. The relationship between the changes in the occupational makeup of the entire labor force and the study occupations is described in Table 2-1.

1/ Sources: U.S. Department of Labor, Bureau of Labor Statistics, The U.S. Economy in 1985, Bulletin 1809, 1974; Tomorrow's Manpower Needs, Supplement No. 4, Estimating Occupational Separations From the Labor Force For States, 1974; Occupation-by-Industry Matrix, (unpublished), 1974.

Table 2-1

Distribution of Employment in All Occupations and in Study Occupations Grouped by Census Occupational Classifications, 1970, and Projected 1985

Census Occupational Classification	Percent Distribution of Employment			
	1970		1985	
	All Occupations	Study Occupations	All Occupations	Study Occupations
Professional, technical, and managerial workers	23.5%	18.2%	26.5%	20.4%
Salesworkers	6.4	10.6	6.5	10.7
Clerical workers	17.5	18.8	19.5	20.7
Craftsmen and foremen	13.2	19.0	13.0	18.6
Operatives	17.0	15.9	15.1	14.5
Farm managers and owners	2.2	4.0	0.9	1.6
Service workers, excluding household workers	11.4	10.0	12.3	11.7
Private household workers	1.7	0.0	1.0	0.0
Laborers, including farm laborers and foremen	7.1	3.6	5.2	1.8
Total	100.0%	100.0%	100.0%	100.0%

Source: U.S. Department of Labor, Bureau of Labor Statistics, Occupation-by-Industry Matrix, (unpublished), 1974. These data differ from published data pertaining to the same occupational groups in the 1975 Manpower Report of the President, in part, because of changes in occupational classifications and definitions which have been incorporated in the matrix estimates.

Note: Details may not add to totals due to rounding.

White-collar employment in professional, technical, managerial, sales, and clerical occupations is approximately the same in both groups, slightly less than half the total in 1970 and slightly more than half in 1985. However, a larger share of the white-collar workers in the study occupations are clerical or sales personnel. Relatively more skilled craftsmen and foremen and fewer less skilled operatives are included in the occupations singled out for consideration. In the least skilled fields, the laborers jobs and private household work, the study occupations include either a smaller proportion of the total employment or, as in the case of private household workers, they are unrepresented. The 1970 to 1985 trends in both the overall labor force and the study occupations reflect the movement to a more technologically-oriented post-industrial service economy in the United States.

The importance of employment growth and attrition as sources of job openings varies considerably in different occupations. Rapid employment growth is often characteristic of skilled occupations whose job content is closely linked with technological advance, i.e., technicians. High growth rates also frequently come about from growth in demand for services from government or the private sector which are provided in large part by less skilled workers. The nonprofessional health service fields are an instance. The predominance of attrition as the source of job openings in clerical occupations reflects the predominance of women in the clerical work force. The projections of job openings for major groups and individual occupations for which job openings in the 1970 to 1985 period are expected to average 10,000 or more annually are listed in Table 2-2.

Table 2-2

Projected Average Annual Job Openings, Major Occupational Groups and Larger Occupations Included in Study, 1970 to 1985 1/

Occupation	Average Annual Job Openings, 1970-85 Total	Job Openings Due To: Growth	 Attrition
Professional and technical workers	204,000	108,700	95,300
Computer programmers	12,300	7,600	4,700
Drafters	17,000	11,300	5,700
Electrical and electronic engineering technicians	13,300	10,900	2,400
Engineering and science technicians, n.e.c.	29,700	22,300	7,400
Personnel and labor relations workers	29,100	17,600	11,500
Registered nurses	70,300	21,300	49,000
Therapists	12,600	6,400	6,200
Managers and administrators, except farm	344,200	143,300	200,900
Bank officials and financial managers	30,300	13,700	16,500
Buyers, wholesale, and retail trade	11,800	7,000	4,700
Managers and administrators, n.e.c.	247,500	102,300	145,200
Managers and superintendents, building	13,000	4,900	8,200
Restaurant, cafeteria, and bar managers	22,300	5,500	16,800
Sales managers and department heads, retail	18,900	10,200	8,700
Salesworkers	316,500	100,000	216,500
Insurance agents, brokers, and underwriters	23,700	10,900	12,800
Real estate agents and brokers	26,900	8,900	17,900
Sales representatives, manufacturing	16,800	6,600	10,200
Sales representatives, wholesale	31,200	13,500	17,700
Salesclerks, retail trade	175,500	42,300	133,200
Salesworkers, retail trade	21,400	7,700	13,700
Salespeople, service and construction	14,000	6,600	7,400
Clerical workers	794,700	228,200	566,500
Billing clerks	16,500	6,500	10,000

Table 2-2 (Continued)

Occupation	Average Annual Job Openings, 1970-85		
		Job Openings Due To:	
	Total	Growth	Attrition
Bookkeepers	117,000	24,000	93,000
Computer equipment operators	14,400	9,300	5,100
Keypunch operators	13,900	-3,900	17,700
Payroll and timekeeping clerks	14,300	4,200	10,100
Secretaries	364,800	113,400	251,400
Shipping and receiving clerks	15,100	4,400	10,700
Statistical clerks	22,200	5,600	16,600
Stock clerks and storekeepers	27,300	11,600	15,700
Typists	111,600	28,500	83,100
Miscellaneous clerical workers	50,200	20,100	30,100
Craftsmen and foremen	342,100	161,500	181,000
Air conditioning, heating and refrigeration mechanics	12,200	9,000	3,200
Auto mechanics	29,000	14,200	14,800
Carpenters	40,100	14,300	25,700
Electricians	23,100	13,300	9,800
Excavating, grading, and road machine operators	15,300	9,300	6,000
Foremen	51,800	20,000	31,800
Heavy equipment mechanics, including diesel	31,100	16,500	14,600
Machinists	15,200	6,900	8,300
Painters, construction and maintenance	14,200	3,000	11,200
Plumbers and pipefitters	18,300	9,700	8,700
Operatives	307,500	95,300	212,200
Assemblers	44,500	10,400	34,100
Bus drivers	13,800	5,700	8,100
Checkers, examiners, and inspectors, manufacturing	35,300	9,300	26,000
Cutting operatives	11,400	3,900	7,500
Delivery and route workers	27,100	12,700	14,400
Sewers and stitchers	64,700	8,100	56,600

Table 2-2 (Continued)

Occupation	Average Annual Job Openings, 1970-85 Total	Job Openings Due To: Growth	 Attrition
Truck drivers	38,000	16,600	21,400
Welders and flame cutters	26,000	15,500	10,500
Service workers	428,800	155,500	273,300
Bartenders	10,200	3,100	7,100
Cooks, except private household	52,300	11,900	40,300
Childcare workers, except private household	43,500	13,800	29,700
Firefighters	11,700	8,900	2,800
Food service workers, except private household	31,300	8,200	23,100
Hairdressers and cosmetologists	49,100	12,100	37,000
Health aides, except nursing	22,000	9,800	12,200
Housekeepers, except private household	12,700	4,500	8,100
Nursing aides, orderlies and attendants	97,200	35,100	62,100
Police and detectives	19,300	13,300	6,000
Practical nurses	69,300	31,000	38,300
Laborers, except farm	20,300	-1,900	22,200
Gardeners and groundskeepers, except farm	21,900	1,200	20,700
Total, All Occupations Studied	2,753,000	905,000	1,848,000
Total, All U.S. Occupations	4,946,000	1,524,000	3,422,000
Occupations Studied as a Percent of All U.S. Occupations	56%	59%	54%

1/ For complete occupational listing see Appendix C, Table C-5.

Sources: Derived from U.S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Supplement No. 4, Estimating Occupational Separations From the Labor Force for States; and sources in Table 2-1. Note: Details may not add to total due to rounding.

The job openings projections show the impact of many forces, including greater automation and mechanization, changes in national priorities, and the GNP growth rate assumed in the projections. Greater use of automated data processing can be expected to both increase and decrease skills and manpower requirements in many fields. As bookkeeping and record keeping have become automated, employment in clerical fields, such as bookkeeping, has grown slowly or declined, while requirements for the more highly skilled computer operators, programmers, and repairmen have increased. In other instances, the changes toward use of more complex technology are likely to reduce skill requirements. Instances include the introduction of cash registers which compute the change due customers and relieve the cashiers of the need to possess the skills required to undertake this operation.

Shifts in national priorities can also influence job opportunities. Achieving goals in pollution abatement similar to those in the Air Quality Act or the Water Quality Act would significantly increase expenditures for capital goods and for the pollution control equipment used in motor vehicles. This spending would increase requirements for factory operatives in the industries producing the equipment, and for engineers, designers, technicians, and mechanics who design, operate, and repair the equipment. 1/ A high priority assigned to offsetting the rising price of imported petroleum by developing new energy sources within the United States, such as obtaining oil from shale rock, would change the regional as well as the occupational and industrial distribution of employment. The high priority given to making health care more readily available to Americans, a priority illustrated by Medicare, Medicaid, and the expansion of employers' group health programs, contributes to the large increases anticipated in job openings for nonprofessional health therapists and aides of many kinds. Enactment of some version of national health insurance in the next ten years, together with efforts to seek more efficient ways of providing health services could increase requirements for health personnel considerably beyond those anticipated in the projections and change occupational requirements to include more technicians to operate automated diagnostic and other testing equipment.

1/ See Lecht, L., Gutmanis, I., and Rosen, R., Assessing the Impact of Changes in National Priorities on the Utilization of Scientists and Engineers in the 1970's, National Science Foundation, 1974.

The projections assume a GNP growth rate of 4.6 percent a year in the 1970's followed by a decline to 3.2 percent in the 1980 to 1985 period. The decline stems from the expected slowing down in labor force growth following the fall-off in birth rates in the 1960's. It is also affected by continued growth in the importance of service industries, industries whose productivity, as conventionally reckoned in output per man-hour, is less than in goods-producing industries. The recession characterizing 1974 and 1975, if it were to continue, would outmode projections based on the expectation of substantial economic growth in the 1970's. The unemployment-prone groups, nonwhites, teenagers, and women, would be most affected by a slowing down in economic activity in obtaining jobs and in penetrating into new and more desirable fields. The unemployment rate for Negroes and other nonwhites, for example, was 9.9 percent in 1974 compared with 5 percent for whites. Averaging job openings over the 1970 to 1985 period tend to diminish the influence of cyclical fluctuations which can cause the projections at a particular time to be wide of the mark. In addition, slow GNP growth typically affects employment growth more heavily than replacement demand. The importance of replacement demand in the job openings projections makes them less sensitive to changes in the pace of GNP growth than would be the case for employment projections alone.

National manpower projections can sometimes be misleading because they overlook developments in individual regions and states which often follow a different pattern from the national one. Young people entering the labor force typically obtain jobs, at least their first full-time job, in their local area. With the passage of time, the availability of more attractive opportunities elsewhere will attract persons from areas of slow growth to more rapidly expanding states and regions. The occupational and industrial makeup of employment in the rapidly growing areas frequently diverges from the national pattern reflecting the weight of rapidly growing industries contributing to the high growth rates. The aerospace and electronics industries in California in the 1960's supply instances. The differences in the anticipated patterns of economic growth by region are summarized in Table 2-3.

Table 2-3

Estimated Changes in Employment by Region, 1970 to 1985

Region	Percent Change, 1970 to 1985
New England	21%
Middle Atlantic	25
Great Lakes	22
Southeast	29
Plains	26
Southwest	31
Mountains	36
Far West	38

Source: National Planning Association, Regional Economic Projections: 1960-85, Report No. 73-R-1, 1973, Table 1, p. S-3.

The areas where the more rapid employment growth is anticipated are concentrated in the western states, especially in the mountain areas and the Pacific Coast. Many young people now in school in New York or Rhode Island or Nebraska, to cite instances, at some stage in their careers are likely to move to these areas of rapid growth. The recent decline in manufacturing jobs in the New York metropolitan labor market area underscores the importance of regional, state, and local differences in employment growth in assessing the relationship of occupational training programs to career opportunities for their students or to the economy's future manpower needs. 1/

1/ While employment in manufacturing in the United States grew by 4.8 percent between 1965 and 1972, employment in manufacturing in New York City declined by 21.6 per cent in the same period. See Puryear, D. and Bahl, R., "Economic Problems of a Mature Economy," Maxwell School, Syracuse University, (unpublished), 1975.

Although rapid growth can be anticipated in many occupations, employment growth will be considerably less important than the replacement of attrition losses as a source of job openings in the coming decade. Employment growth will contribute significantly to job openings in technician and health service fields. However, over half of the job openings are expected to take place in 12 large occupations characterized by a preponderance of job openings arising from replacement needs. Women make up over half of the work force in 10 of these 12 fields.

In a dynamic economy, employment in some fields will be increasing in response to economic, social, and technological changes while employment in others is declining. The economy-wide employment level is estimated to grow by 29 percent between 1970 and 1985. Employment growth in many of the occupations included in the study is projected to amount to more than 29 percent, in some instances to more than 50 or 100 percent. Other occupations list decreases although there are fewer decreases than increases and the percentage decreases are generally smaller.

Table 2-4 summarizes the strong cases of employment growth and decline in the study occupations. The table lists the occupations for which the employment is expected to at least double together with those for which the decline is projected to be greater than a third.

Table 2-4

Study Occupations in Which Employment is Projected to Increase Rapidly or to Decline Significantly, 1970 to 1985

Occupation	Employment (in thousands) 1970	Employment (in thousands) 1985	Percent Change in Employment, 1970 to 1985
Occupations listing increases of 100% or more:			
Therapists 1/	82	178	117%
Practical nurses	370	835	126
Health aides, except nursing	133	280	111
Electrical and electronic engineering technicians	154	317	106
Other technicians, except health	37	95	157
Data processing machine repairers	36	93	158
Engineering and science technicians, n.e.c.	190	525	176
Air conditioning, heating, and refrigeration mechanics and repairers	130	265	104
Occupations listing declines of 34% or more:			
Farm owners and tenants	1690	867	-49
Farm laborers, wage workers	897	401	-55
Tabulating machine operators	9	3	-67
Stenographers	128	78	-39
Carpenter helpers	117	70	-40
Printing trades apprentices, except pressmen	6	3	-50
Solderers	42	24	-43
Total Employment, All U.S. Occupations	78,600	101,500	29

Source: U.S. Department of Labor, Bureau of Labor Statistics, Occupation-by-Industry Matrix Projections for 1985, (unpublished), 1974.

1/ Includes various medical technical specialties, such as inhalation therapists, occupational therapists, etc.

Three of the eight fields listing increases of 100 percent or more are health occupations. The other five are technical specialties requiring knowledge of modern technology, especially electronic and electrical technology. The decreases in employment stem primarily from continued technological change. The declines in employment are especially marked in the farm occupations. The smaller number of farmers and farm laborers projected for the 1980's reflects the anticipation of continuing high productivity increases in agriculture resulting from mechanization and growth in corporate farming. These developments are reinforced by the tendency for the consumption of farm products to rise but at a less rapid rate than GNP. The large decline for stenographers comes about from the widespread acceptance of dictating equipment in everyday office use.

The lesser role of rapid employment growth in generating job opportunities is illustrated by the occupations in which employment is expected to at least double or more in the 1970 to 1985 period. All told, these fields are projected to supply only about 5 percent of all job openings in the occupations studied. By comparison, over half of the job openings would take place in 12 large established occupations which are estimated to provide an average of 50,000 job openings a year or more. They include both rapidly growing health fields and occupations expected to show only modest growth such as bookkeepers. These 12 large occupations are characterized by the importance of attrition in their prospective job openings and the high representation of women in their work force. The occupations are described in Table 2-5.

Table 2-5

Estimated Sources of Job Openings and Representation of Women in Occupations Expected to Provide Large Numbers of Job Openings, 1970 to 1985

Occupation	Average Annual Job Openings, 1970-85			Women as % of Work Force, 1970
		Openings Due To:		
	Total	Growth	Attrition	
Secretaries	364,800	113,400	251,400	97.6%
Managers and administrators (not elsewhere classified)	247,500	102,300	145,200	11.6
Salesclerks, retail trade	175,500	42,300	133,200	64.8
Bookkeepers	117,000	24,000	93,000	82.1
Typists	111,600	28,500	83,100	94.2
Nurses aides	97,200	35,100	62,100	84.6
Registered nurses	70,300	21,300	49,000	97.4
Practical nurses	69,300	31,000	38,300	96.3
Sewers and stitchers	64,700	8,100	56,600	93.8
Cooks, except private household	52,300	11,900	40,300	62.8
Foremen	51,800	20,000	31,800	8.0
Miscellaneous clerical workers	50,200	20,100	30,100	64.5
Total, 12 Occupations	1,472,200	458,000	1,014,100	
Percent of All Job Openings in Study Occupations	53.5%	50.6%	54.9%	

Source: See Table 2-2.

Attrition exceeds employment growth as a source of job openings in these fields by an average of 2.2 to 1. Women make up over half of the work force in 10 of the 12 occupations in the table. The high rate of attrition for retail salesclerks or secretaries results mainly from the predominance of female employees who leave the labor force for reasons of marriage or child rearing and later frequently return. Significantly, employment growth makes up a larger percentage of the job openings for craftsmen than for any other nonprofessional group. While the average age in many skilled crafts is high, leading to substantial replacement requirements, this is offset by the sizeable employment growth anticipated in individual crafts, especially those concerned with the maintenance and repair of air conditioning or communications equipment, or with electrical and electronic equipment of many kinds. For much the same reasons, rapid employment growth is also expected to outweigh attrition in many non-medical technician and semi-professional occupations.

Women are expected to make up a larger share of the labor force by 1985, to increase by 32 percent between 1970 and 1985 as compared with 25 percent for men. 1/ With the present attrition rates for women, replacement demand would make up a more important source of job openings in the next decade than in the past one. Continuation of the recent tendencies toward smaller families, later age of marriage for women, and greater availability of child care facilities would reduce female attrition rates. Continued emphasis on early retirement for men and women would increase replacement demand although frequently the replacement would be for a less well-paid worker who had been upgraded to fill the vacancy created by the retirement of older and more experienced persons. Since estimates of replacement demand are based on rates of withdrawal from the labor force for different age and sex groups derived from past experience, they are subject to change. Changes in the status of women, in retirement practices, or changes in mortality in the coming decade could be expected to influence attrition rates and replacement demand in the 1980's.

Projections based on replacement demand and the expected employment growth are incomplete representations of future job openings. They exclude large elements of labor turnover which fluctuate too markedly with changes in business conditions or even in the weather to be taken into account in the projections. Employees may quit their jobs in search of more desirable positions, or move to another area, and be replaced by other persons. They may be laid off because of cyclical downturns in business conditions and other persons hired when economic conditions improve. Seasonal changes in the weather will often cause construction workers to be without employment, and others may replace them when construction is resumed. Since these components of turnover are subject to wide fluctuations which cannot be anticipated in advance, they are omitted from the estimates of replacement needs. Accordingly, the job openings projections based on employment growth and withdrawals from the

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1/ Manpower Report of the President, 1975, pp. 203, 309.

labor force have a built-in bias toward underestimating future job opportunities because of the great uncertainty surrounding a major component of employee turnover.

III.

The projections of job openings point to the need to expand the range of occupations for which vocational training is available if the tendency to prepare students for low paying careers is to be minimized in the coming decade. Rapid growth in some low-paying fields, together with replacement demand in these occupations, contributes to a concentration of job openings at the lower end of the earnings distribution. However, eliminating the effects of replacement demand and concentrating on employment growth makes it apparent that the spread of earnings away from the economy-wide median for persons employed in the occupations considered will be greater in the mid-1980's than in 1970. Many of the more highly paid occupations will be in technical specialties, in finance and real estate, and in management or personnel work.

Nearly seven-tenths of the job openings in the occupations considered are in occupations which paid less than the economy-wide median of slightly under $10,000 for full-year workers in 1970. While this concentration reflects the exclusion of many professional fields, it also stems from the high attrition rates in many lowly-paid positions. Because of the high replacement demand, the job openings anticipated in these occupations in the 1970 to 1985 period make up a considerably larger percentage of the total than was the case with the employment in these fields in 1970. The high turnover in poorly-paying occupations can make them appear as attractive candidates for educational or manpower training programs because of their large number of job openings, openings often difficult to fill.

Table 2-6 highlights the importance of replacement demand in creating job openings in low-paying occupations by comparing the job openings distribution grouped by the 1970 median earnings with the comparable distribution of employment in that year.

Table 2-6

Distribution of Projected Average Annual Job Openings, 1970 to 1985, Grouped by Median Earnings in 1970, Compared With Employment Distribution in 1970

Occupations With Median Earnings in 1970 of: 1/	Percent of Average Annual Job Openings, 1970 to 1985	Percent of Employment in 1970 2/
Under $6,000	15.5%	12.3%
6,000 - 7,999	34.9	29.1
8,000 - 9,999	19.1	23.8
10,000 - 11,999	12.4	14.7
12,000 - 13,999	6.9	7.8
14,000 and over	11.3	12.4
Total	100.0%	100.0%

1/ Refers to median earnings of persons who worked for at least 50 weeks during the year.

2/ Source: Derived from U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population, Subject Report, Occupational Characteristics.

Note: Details may not add to totals due to rounding.

Half of the job openings are listed in the under $8,000 group of occupations. Only slightly more than two-fifths, 41 percent, of the persons employed in these positions in 1970 earned less than this amount. In the fields paying more than $8,000 to full-year workers in 1970, the percentage of persons employed in each income group was greater than the proportion of job openings. Accordingly, the frequent availability of large numbers of job openings in low-paying fields, i.e., sewers and stitchers, often reflects high turnover for a largely female work force rather than the presence of desirable career opportunities.

While the rapidly growing fields in which attrition is less important include many well-paid occupations, they also include many poorly-paid jobs. The high national priority for health, for example, makes for rapid growth in employment in lowly-paid nonprofessional health service fields, a growth which is frequently accompanied by comparably high attrition. Rapid expansion in employment in other occupations, technicians are another instance, can provide well-paid and attractive career prospects. The loose association between employment growth and earnings is illustrated by the ten most highly paid and the ten most poorly paid fields among those considered in the study.

Table 2-7

Median Earnings in 1970, and Projected Employment Growth, 1970-1985, Ten Highest Paid and Ten Lowest Paid Study Occupations

Occupation	Median Earnings, 1970 a/	Percent Increase in Employment, 1970-1985
Ten highest paid:		
Stock and bond sales agents	$23,070	49%
Managers and administrators, n.e.c.	16,770	35
Bank officials and financial managers	15,990	62
Sales representatives, manufacturing	15,540	25
Real estate appraisers	15,450	58
Designers	14,260	48
Personnel and labor relations workers	13,820	92
Sales representatives, wholesale	13,690	32
Computer programmers	13,600	64
Mechanical engineering technicians	13,430	50
Ten lowest paid:		
Practical nurses	5,870	126
Hairdressers and cosmetologists	5,770	38
Cooks, except private household	5,470	22
Health aides, except nursing	5,440	111
Nurses aides	4,890	63
Sewers and stitchers	4,880	13
Farm laborers	4,750	-55
Dressmakers and seamstresses	4,390	-6
School monitors	3,870	85
Childcare workers	3,840	61

Sources: U.S. Department of Commerce, Bureau of the Census, 1970 Census Report, Occupational Characteristics; U.S Department of Labor, Bureau of Labor Statistics, Occupation-by-Industry Matrix Projections, (unpublished), 1974.

a/ Earnings data refer to full-year workers.

The high-paying occupations are typically expected to grow more rapidly than the low-paying ones, and none are projected to undergo an employment decline. Five of the ten are estimated to increase by 50 percent or more between 1970 and 1985. The low-paying fields, by comparison, include both the largest percentage increases, for practical nurses and health aides, and they also show the two instances of declining employment, for farm laborers and dressmakers and seamstresses. As many of the low-paying fields are listed to increase by at least 50 percent as the high-paying occupations, five in each group. While educational achievement levels clearly differentiate the high from the low-paying jobs, it is significant that in only one of ten better-paying fields was the work force in 1970 made up of a majority of persons with four or more years of college. The single exception were the stock and bond sales agents. The high-paying fields, therefore, can offer appropriate potentials for vocational training, often in post-secondary institutions.

Eliminating the influence of replacement demand makes it apparent that more of the persons at work in the study occupations in the mid-1980's will be employed in fields which pay either considerably more or considerably less than the economy-wide median for year-round workers. As the reverse side of this distribution, a smaller percentage will be at work in fields in which earnings are relatively close to the national figure. The increase in the dispersion of earnings follows from the anticipated greater-than-average growth in the highly-paid and the poorly-paid occupations.

The greater dispersion of earnings is also influenced by the expected tendency for earnings in the better-paying occupations to increase as a percentage of the national average, and for the income received in poorly-paid fields to decline relative to other occupations. For instance, in the ten highest paying fields listed in Table 2-7, earnings for full-year workers in six positions are expected to increase as a ratio to the national median and to undergo a relative decline in only three. In the ten lowest paid occupations, earnings are projected to decrease relative to the economy-wide average in six, and to increase in two. To cite an illustration drawn from the highly-paid occupations, the annual earnings of sales representatives, manufacturing, are projected to increase from $15,540 in 1970 to $26,110 in 1985. Expressed as a percentage of the economy-wide median, this represents a change from 156 to 171. The comparable earnings for nurses aides, a low-paying field, are estimated to rise from $4,890 to $6,940. This constitutes a decline from 49 percent of the national average in 1970 to 45 percent in 1985. While the changes in the earnings in high and low paid fields relative to the national median are generally small, the shifts in position emphasize the tendency for occupations at both ends of the earnings distribution to depart further from the average in the next decade.

Table 2-8 summarizes the increase in the dispersion of earnings by comparing the distributions in 1970 and 1985.

Table 2-8

Dispersion of Median Earnings in Study Occupations Around Economy-wide Median for Full-Year Workers, 1970 and Projected 1985

Occupations With Median Earnings Deviating From Economy-wide Median 1/	Percent Distribution of Employment		Earnings Range	
	1970 2/	1985	1970	1985
By 25 percent greater or more	17.0%	21.4%	$12,431 or more	$19,075 or more
Within 25 percent in either direction	50.1	42.2	7,460-12,430	11,446-19,074
By 25 percent below median or more	33.0	36.4	7,459 or less	11,445 or less
Total	100.0%	100.0%		
Economy-wide Median (in 1973 dollars)	$9,945	$15,260		

1/ Refers to median earnings of persons who worked at least 50 weeks during the year.

2/ Source: See Table 2-6.

Note: Details may not add to total due to rounding.

Between 1970 and 1985 the median earnings of full-year workers in all occupations are projected to rise from $9,945 to $15,260. This constitutes an increase of slightly more than half. The growth in earnings stems from the expected GNP and productivity growth together with the nation-wide shifts in the occupational makeup of the labor force toward a greater representation of the more skilled and better paying fields. The major change in the occupations studied is the greater concentration of employment at both extremes away from the national median. For example, half of the persons employed in these positions in 1970 were at work in fields which paid full-year workers within 25 percent of the national median in either direction. This proportion is projected to decrease to slightly more than two-fifths, or 42 percent, by 1985. Earnings levels are expected to increase in virtually all occupations in the 1970 to 1985 period so that persons earning 25 percent below the national average could still be receiving as much as $11,445 a year. The percentage of employees under this figure, or receiving 25 percent or more below the national median, is estimated to increase from 33 to over 36 percent. The percentage receiving at least 25 percent more than the economy-wide average, or over $19,000, is estimated to rise from 17 to nearly 21.5 percent. The spread of earnings in the study occupations in 1970, or in projected earnings levels in 1985, highlights the broad range of earnings in the occupations which are typically filled by graduates of vocational training programs or are prospective candidates for these programs.

The earnings estimates for 1985 represent "surprise free" projections based on recent relationships between changes in earnings in individual occupations and changes in productivity in the industries which employ the bulk of the persons at work in these positions. This relationship builds in the interplay between changes in productivity, in the "human capital" represented by differences in skill levels and educational attainment, in the strength of collective bargaining, and other factors which affect the supply and demand for labor in particular fields. 1/ Even more than projections of employment, anticipations of future earnings contain an element of uncertainty because the relationships they assume from past experience are sometimes unstable, and they may undergo unanticipated changes in the future. The projections, therefore, can be regarded as points on a scale which illustrate "what would happen if" the relationships between earnings and productivity in the past ten or fifteen years were to continue through the coming decade. A marked change in productivity growth, in the supply of persons seeking to enter a particular field, or manpower bottlenecks generated by sharply rising demand for the output produced by specific groups of workers could shift earnings above or below the points represented by the projections. These changes, however, would be less likely to substantially narrow the range of earnings in the occupations typically involving skill or training of a type different from what is represented by a four-year college degree.

1/ For a discussion of the procedures used in making the earnings projections, see Appendix A.

The employment, job openings, and earnings data identify alternatives for expanding the career options open to persons who differ in their aspirations, their abilities, their educational achievements, and their interests. Some individuals, often those with limited academic abilities, or from personal preference, may seek employment in low-paying fields in which many job openings are anticipated in the next decade. Employment in these occupations, as in the health service fields, frequently serves important economic and social needs. It is reasonable to expect that a majority of persons receiving occupational training will be attracted to fields which offer good prospects of increasing their earnings potential. The projections make it evident that there are large numbers of occupations offering better-than-average earnings which are suitable candidates for vocational training.

CHAPTER 3

THE EDUCATIONAL ATTAINMENT INDICATORS

I.

Three tendencies stand out in characterizing the changes in educational attainment in the largely nonprofessional occupations included in the study. One is the continued sharp decline in the proportion of persons employed in them with less than twelve years of schooling, a decline most pronounced in the less skilled fields. Another is the relatively modest penetration of college graduates into fields in which few college graduates had been employed in the past. A third is the persistence of the association between educational attainment and earnings, an association less apparent for groups, such as women, than for the overall labor force.

The increase in the size of the group who are high school graduates or have some college education in the study occupations is expected to substantially outweigh the increase in the representation of college graduates. For example, the increase in the number of workers with 12 to 15 years of schooling in the 1970 to 1985 period is projected to amount to almost seven times the growth in employment of persons with a full college education. The projections also suggest that the anticipated oversupply in some fields in which the college degree is typically a requirement for admission, i.e., teaching, is likely to be accompanied by a greater representation of college graduates in managerial, sales, finance, and technical positions already employing large numbers of college graduates. Less than 3 percent of the work force in blue-collar or service fields in 1985 is expected to be made up of persons with four or more years of college.

The historical data and the projections underscore the association between educational attainment and earnings. The economic advantage of the group with sixteen or more years of schooling is apparent in the distribution of employment by earnings. Nearly three-fifths of the persons in 1970 in the occupations receiving consideration with this level of educational attainment were in fields yielding $12,000 or more to full-year employees. Approximately three-fourths of the high school "dropouts" were employed in occupations providing earnings less than the economy-wide median of $9,945 for year-round employees. Occupational training in or out of the public schools represents an important form of education. A 1970 Census survey of vocational training shows that the persons, other than college graduates, who had completed a formal occupational training program had higher earnings than those who had never participated in or completed such a program.1/ The differential was apparent in all occupational groups.

The data dealing with educational attainment indicate broad trends marked by numerous exceptions. For instance, while the educational attainment level for the entire work force has undergone a marked upgrading

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1/ U.S. Bureau of the Census, 1970 Census of Population, Subject Report, Vocational Training, 1973.

in the past two decades, rapid growth in employment in some occupations characterized by low levels of educational achievement is likely to increase the number of dropouts employed in these fields. Examples include nurses aides, construction machine operators, and many food service fields. And, while the proportion of college graduates entering the better paid nonprofessional white-collar fields is expected to increase, it is projected to decline in several of these occupations. Recreation workers and personnel and labor relations workers are instances. Although higher educational attainment and greater earnings generally go together, many women with 12 to 15 years of schooling were in the relatively low-paid $6,000-$8,000 earnings group in 1970. Research and national policy have emphasized the economic penalty attached to becoming a high school "dropout." Yet, in some fields the lifetime earnings of persons who did not complete high school are greater than those who graduate. To cite illustrations, the earnings foregone by completing a fourth year of high school by white male students who later became electricians or linemen were sufficient to reduce the present value of their lifetime earnings at age seventeen by over $2,000 as compared to persons with lesser education in the same fields. 1/ These offsetting tendencies do not negate the general directions apparent in the historical data and the projections. They do suggest that the educational attainment data, like other manpower information, is compatible with a range of policy options adapted to the needs of individuals who differ in their aspirations, their abilities, their interests, and their labor market circumstances.

1/ Schweitzer, S.O., "Occupational Choice, High School Graduation, and Investment in Human Capital," Hearing of the Joint Economic Committee of Congress, Subcommittee on Economy in Government, National Priorities, 1-18, June, 1970.

II.

The continued rise in the level of educational attainment implies that the high school diploma will become more of a minimum requirement for employment in most occupations in the 1980's than it has been in the recent past. Over three-fourths of the employment in the study occupations in the mid-1980's, to cite a summary statistic, is projected to occur in fields in which persons with 12 to 15 years of schooling will make up three-fifths or more of the work force. This represents an increase from 30 percent in 1970. In many nonprofessional white-collar occupations, employees with a high school diploma or junior college credentials will face increasing competition from college graduates. This competition may be less severe than is often anticipated because of the decline in the proportion of high school graduates entering college beginning in the late 1960's.

Allowing for a sizeable increase in the supply of college graduates, the most striking change in the projections is the growth in the number of high school and post-secondary graduates. The growth reflects a major fall-off in the size of the group who do not complete high school, a decline most marked in the less skilled operative, laborers, farm, and service occupations.

The anticipated changes in educational attainment are summarized in Table 3-1. The table refers to the persons employed in the 123 occupations included in the study.

Table 3-1

Distribution of Educational Attainment, by Major Occupational Group, Occupations Included in Study, 1970 and Projected 1985

Occupational Group	1970 % of Workers Completing: Less Than 12 Years	 12-15 Years	 16 Years or More	1985 % of Workers Completing: Less Than 12 Years	 12-15 Years	 16 Years or More
Professional and technical workers	9.9%	68.7%	21.4%	5.8%	71.3%	22.9%
Managers and administrators, except farm	25.4	54.5	20.1	10.9	62.0	27.1
Salesworkers	29.5	58.2	12.2	16.1	68.7	15.2
Clerical workers	16.4	78.6	5.0	8.1	86.2	5.7
Craftsmen and foremen	49.6	48.5	1.9	32.3	65.2	2.5
Operatives	59.5	39.8	0.7	44.0	55.0	1.0
Service workers	46.5	51.5	2.0	29.5	68.1	2.4
Laborers, except farm	71.2	27.4	1.5	57.9	39.4	2.2
Farm occupations	64.1	33.1	2.8	44.1	51.1	4.8
Total	38.6	54.6	6.8	22.8	68.1	9.1

Note: Details may not add to totals due to rounding.

Sources: U.S. Bureau of the Census, 1970 Census of Population, Subject Report, Occupational Characteristics; U.S. Department of Labor, Bureau of Labor Statistics, Occupation-by-Industry Matrix Projections, (unpublished), 1974; The Conference Board.

In 1970 the high school "dropout" population in the labor force was still an important group. In that year over half of the persons in the study occupations employed as operatives, laborers, or in the farm occupations had less than four years of high school. Nearly half of the craftsmen were in the same educational group. By 1985, persons lacking a full high school education are expected to constitute a majority only among the laborers. Part of the sharp decline in employment for persons with limited education stems from the anticipated steep decline in the employment of farm laborers, one of the least well-educated and most poorly paid employee groups in the economy. The increases in the representation of college graduates in the occupations considered are modest. They are projected to grow from less than 7 to slightly more than 9 percent of the work force in the 123 occupations.

The age distribution has an important bearing for the educational attainment level in individual occupations. Younger workers, the newer entrants into the labor force, have typically attended school for a longer time than older workers who completed their schooling at a time when less attention was paid to educational credentials in hiring. The significance of the age factor is illustrated by selected instances drawn from the study occupations. They are summarized in Table 3-2.

Table 3-2

Comparison of Years of Schooling Completed by All Workers and Workers 16 to 34 Years Old, Selected Occupations, 1970

	Percent Completing:		
Occupation and Age Group	Less Than 12 Years	12-15 Years	16 Years or More
Practical nurses			
All ages	30%	69%	1%
16-34	11	88	1
Bookkeepers			
All ages	16	78	5
16-34	10	85	5
Auto mechanics			
All ages	57	42	1
16-34	45	54	1
Carpenters			
All ages	60	38	1
16-34	35	63	2
Machinists			
All ages	46	53	1
16-34	30	69	1

Note: Details may not add to totals due to rounding.

Sources: U.S. Bureau of the Census, 1970 Census of Population, Subject Report, Occupational Characteristics; Special Tabulations, 1970 Census Public Use Tapes.

The "all ages" group includes the 16 to 34 year olds so that the presence of many younger workers in an occupation tends to increase its educational level. The occupations included in Table 3-2 illustrate the shift in nonprofessional occupations toward a considerably greater emphasis on completion of high school and, frequently, some post-high school education as well. Although age has only a minor bearing on the proportion of college graduates in the occupations listed, it has a major bearing in other educational levels. While the occupations selected are strong cases, the trends they illustrate are generally evident, to a greater or lesser extent, in other fields. In only five of the 123 occupations considered was the percentage of workers in the under 35 age group with less than 12 years of schooling in 1970 as great as the representation of this group in the overall occupational work force.

The distribution of educational attainment, like the anticipated growth in employment, varies considerably from state to state and from region to region. The variations grow out of differences in the occupational makeup along with dissimilarities in the age, race, and sex composition of the area's work force. The resources available to the educational systems as illustrated by the per pupil expenditure in elementary and secondary schools are also probably a factor. The importance of the regional differences are illustrated by a comparison of Kentucky, a state with a large rural sector, and New Jersey, primarily an industrial state, with the entire United States. The comparison refers to all occupations rather than to the 123 receiving special consideration.

Table 3-3

Distribution of Educational Attainment, Kentucky, New Jersey and the Entire United States, 1970

Years of Schooling Completed:	Percent Distribution of Employed Work Force		
	Kentucky	New Jersey	United States
Less than 12 years	48.2%	39.5%	37.2%
12 to 15 years	41.8	46.2	50.4
16 years and over	10.0	14.4	12.4

Note: Details may not add to totals due to rounding.

Source: See Table 3-2.

Nearly half of the employed persons in Kentucky in 1970 could be classified as high school "dropouts" as compared to three-eighths for the entire United States and slightly more in New Jersey. There were considerably more college graduates in New Jersey than in Kentucky and somewhat more than in the entire United States. Current per pupil expenditures in the public elementary and secondary schools were higher, nearly $1,300 in New Jersey as compared to over $700 in Kentucky. If educational attainment can be regarded as an indicator of a type of investment in human capital embodied in individual persons, the investment is greater in industrial and wealthier states like New Jersey than in more heavily rural and less wealthy states, such as Kentucky. While personal income levels are affected by many elements other than education, per capita personal income in New Jersey in 1973 was about 45 percent greater than in Kentucky, approximately $5,750 in New Jersey and $4,000 in Kentucky. 1/

1/ Statistical Abstract, 1974, pp. 130 and 380.

Nationally, the occupations included in the study in which employment is expected to increase especially rapidly are largely fields in which a greater-than-average proportion of the work force possesses a full high school or some college education. The educational achievement level of the rapidly expanding fields is illustrated by the occupations in which employment is projected to increase by 100 percent or more between 1970 and 1985.

Table 3-4

Distribution of Educational Attainment in 1970 in Study Occupations in Which Employment is Projected to Increase by 100% or More, 1970-1985

	Percent Distribution of Educational Attainment in 1970		
Occupation	Less Than 12 Years	12-15 Years	16 Years or More
Therapists	6.3%	38.3%	55.4%
Practical nurses	29.9	69.1	1.0
Health aides, except nursing	38.0	57.7	4.3
Electrical and electronic engineering technicians	11.5	83.0	5.5
Engineering and science technicians, (not elsewhere classified)	14.3	72.7	13.0
Other technicians, except health	12.1	72.3	15.6
Data processing machine repairers	6.1	88.5	5.4
Air conditioning, heating, and refrigeration mechanics and repairers	47.9	50.8	1.3
All Study Occupations	38.5	54.8	6.7

Note: Details may not add to totals due to rounding.

Source: See Table 3-1.

The rapidly growing fields listed in the table, other than the health service occupations, are among the higher paid occupations considered although their earnings are often less than in managerial, financial, or specialized sales positions. In six of the eight occupations listed, the percentage of high school dropouts was less and persons completing 12 to 15 years of schooling was greater than the overall average. In one of the two exceptions, the medical therapists, the representation of high school graduates was low because a majority of the persons employed had completed four or more years of college. In most of these fields, however, there were relatively fewer college graduates employed than in the overall group. The rapidly growing and better paid fields have frequently become the special concern of post-high school occupational education, education often provided by community colleges.

There has been widespread concern in the past few years that an oversupply of college graduates in the coming decade will lead to greater competition by college-educated persons for positions which had previously mainly provided employment to high school or post-secondary graduates. For example, the Department of Labor's projections of job openings for college graduates indicate that there will be a total demand for 9.6 million new college-educated workers between 1970 and 1980. Over a fourth of this demand, or 2.6 million job openings, is expected to come about because of educational upgrading as college graduates seek employment in many fields in which fewer of them had been employed in the past.1/ Much of the educational upgrading will take place because of the sharp decline anticipated in requirements for teachers. The Carnegie Corporation Commission on Higher Education estimates that requirements for new teachers will decrease from the equivalent of 35 percent of the college graduates in 1963 and 26 percent in 1968 to between 12 and 15 percent in 1980. 2/

Recent studies show that the economic return to a four-year college education has been diminishing since the late 1960's as the supply of new graduates has come to exceed the growth in demand in the occupations in which these persons had typically been employed in the past. With this change in supply-demand relationships, the estimated discounted lifetime earnings of graduates of four-year colleges at age 22 is reported to have decreased from $99,200 in 1969 to $95,100 in 1972. The corresponding earnings for persons with four years of high school in this period increased from $87,100 to $88,100. The consequences of these labor market changes show up in a decline from 63 percent in 1968 to 50 percent in 1973 in the proportion of new male high school graduates entering college.3/

1/ Manpower Report of the President, 1972, p. 114.

2/ The Carnegie Commission on Higher Education, College Graduates and Jobs, 1973, p.70.

3/ Freeman, Richard B., "Overinvestment in College Training," The Journal of Human Resources, Summer, 1975.

The projections imply that the increase in representation of college graduates will primarily take place in white-collar technical, managerial, and specialized sales fields. These occupations already employ many persons with 16 or more years of schooling. The penetration of the college graduate population in clerical, service, or blue-collar occupations, including the skilled crafts, is expected to be slight.

The changes in the representation of college graduates in selected individual occupations which illustrate the shifts are described in Table 3-5. The changes for major groups are listed in Table 3-1.

Table 3-5

Projected Changes in Representation of College Graduates in Selected Occupations, 1970 to 1985

Occupation	Percent Completing Four or More Years of College 1970	Percent Completing Four or More Years of College 1985
Computer programmers	41.7%	53.3%
Personnel and labor relations workers	39.1	35.3
Recreation workers	32.0	22.4
Registered nurses	15.9	19.4
Bank officials and financial managers	35.7	52.5
Stock and bond salesmen	53.2	71.3
Sales representatives, manufacturing	27.1	34.9
Police and detectives	6.1	7.9
All Study Occupations	6.8	9.1
All Occupations	12.4	19.0

Sources: See Table 3-2; The Conference Board.

The sizeable increases in the representation of college graduates are expected to occur in white-collar and technical fields, such as computer programmers, bank officials, and stock and bond salesmen. Lesser increases are anticipated in other occupations seeking to attain a more professional status, i.e., registered nurses or police and detectives, or in areas in which earnings are relatively large, i.e., manufacturers sales representatives. The shifts are in both directions since in some semi-professional fields, the proportion of persons with a full four-year college education is projected to decrease. Recreation workers or personnel and labor relations workers are instances.

It is unclear at present how far the penetration of college graduates will increase in nonprofessional fields in the next decade or the degree to which the growth in college enrollments will slow down. Part of the diminished attractiveness of the college degree represents a short-term response to the recession and high unemployment rates characterizing the past few years, and another part constitutes a reaction to longer-term economic and demographic changes. While the decline in requirements for teachers is linked with the drop in birthrates in the past ten or fifteen years, fluctuations in demand for engineers and related technicians stem mainly from changes in economic activity and shifts in national priorities. A national commitment to massive energy research and development programs as proposed by President Ford, Senator Jackson, and others, for example, would probably lead to considerably expanded requirements for engineers and enrollments in colleges of engineering. Moreover, the reactions to the economic environment can sometimes be the opposite of what appeared reasonable in an earlier period. For example, the depressed labor market in 1975 has probably prompted an increase in college enrollment, a rise encouraged by the absence of desirable job opportunities as the alternative to attending college. 1/

If the version of the future represented by the anticipations of declining enrollment growth in higher education were to materialize, a significant by-product would be a greater number of students with good learning ability who would be candidates for occupational education leading to employment in white-collar but nonprofessional fields. Allowing for some slow-down in the growth of college enrollments in the next ten years, it is apparent that the overall educational level in the occupations studied will continue to increase, although at a less rapid pace than in the past. Two major developments can be expected to follow from the greater educational achievement, one economic and the other social. The economic change would take the form of an increase in productivity beyond what would otherwise occur because of the greater "human capital" represented by the rising educational level of the work force. This increment in productivity could, to some extent, offset the slowing down of productivity growth projected in the 1980's, primarily because of the greater weight of the services sector in the economy. The social change concerns the shift in the makeup of the persons available to fill the less well-paid "lower level" occupations in the United States in the

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1/ New York Sunday Times, December 13, 1975, Section IV.

1980's. A generation ago the less-skilled operatives, laborers, and service jobs were usually filled by persons with limited schooling, often with eight years or less of formal education. The work force with these limited educational achievements included many recent migrants from the rural South, from depressed areas such as Appalachia, or from Puerto Rico or Europe. In many European nations that underwent rapid economic growth during the 1960's, the lower level occupations were again filled by migrants, generally individuals with lesser educational attainments who came from southern Europe or North Africa. The comparable positions in the United States in the next ten or fifteen years will be filled by persons usually born in the United States, brought up in metropolitan areas, and with a high school education and sometimes better.

III.

Americans have historically regarded education as one of the most important means for bringing about greater economic and social mobility. The significance attached to these consequences of upgrading educational attainment is evident in the compensatory education programs adopted in the 1960's and in efforts such as the Open Admissions program in the New York City colleges. Recent studies such as the Jencks report at Harvard University have questioned the contribution of education to economic mobility. 1/ The evidence from the occupations included in the study indicates an association between educational attainment and earnings, an association most evident at the extremes of the earnings and the educational distributions. However, the association exists side-by-side with numerous exceptions, especially among disadvantaged groups in the labor market, i.e., women.

The relationship between educational attainment and earnings is evident for persons with less than a full high school education in the lowest and highest earnings groups, and for persons with four or more years of college at all earnings levels. These relationships are summarized for 1970 in Table 3-6.

1/ Jencks, C., Inequality: A Reassessment of the Effect of Family and Schooling in America, 1972. While the Jencks study is concerned with inequality rather than economic mobility, the historic rationale has been that education enhances equality of opportunity by increasing the mobility of persons from low income backgrounds.

Table 3-6

Distribution of Employment by Educational Attainment and Earnings, Occupations Included in Study, 1970

Occupations With Median Earnings in 1970 of: 1/	Percent Completing: Less Than 12 Years	12-15 Years	16 Years or More
Less than $6,000	18.7%	9.0%	2.2%
6,000 - 7,999	24.5	33.9	15.4
8,000 - 9,999	30.5	20.7	11.6
10,000 - 11,999	13.5	15.9	11.2
12,000 - 13,999	5.5	8.2	17.4
14,000 and over	7.3	12.3	42.2
Total	100.0%	100.0%	100.0%

Note: Details may not add to totals due to rounding.

1/ Refers to median earnings of workers employed for at least 50 weeks during the year.

Source: See Table 3-2.

The high school "dropout" group was overrepresented in the two lowest earnings groups and underrepresented in the two highest groups. There were fewer high school graduates in the lowest income group, the under $6,000 group, and a larger percentage in each of the above average income groups beginning with the $10,000 level. However, a larger proportion of the 12 to 15 year group was in the relatively low $6,000 to $8,000 bracket than among the persons with less than a high school education. The economic advantage of the group with 16 or more years of schooling was apparent in both the high and the low income classifications.

The data on the overall relationships between educational attainment and earnings are somewhat misleading because they obscure the differentials in earnings based on sex or race. The differential is evident in the heavy representation of individuals in the 12 to 15 year educational achievement group in the $6,000 to $8,000 earnings bracket. This concentration is largely attributable to lower earnings for women, often clerical workers, than for men with similar educational credentials. The educational attainment of men and women in all occupations in the United States in 1970 as represented by the median number of years of schooling completed was identical, 12.4 years for both. But the economic returns to educational achievement for women has been consistently less. The discrepancy is illustrated in Table 3-7 by the ten occupations receiving consideration in the study employing the largest number of males and the ten employing the largest number of females. The earnings projections for 1985 in the table suggest that if the relationship between earnings and productivity characterizing the past ten or fifteen years continues through the coming decade, the differentials in earnings based on sex will remain and in some instances increase.

Table 3-7

Median Years of Schooling Completed in 1970, and Estimated Earnings in 1970 and 1985, Occupations Included in Study Employing Largest Number of Males and Largest Number of Females

Occupations Employing Largest Number of Males:	Median Years of Schooling Completed in 1970	Median Earnings of Full-Year Workers 1970	Median Earnings of Full-Year Workers Projected 1985	Percent Change, 1970-1985
Auto mechanics	10.5	$ 9,070	$13,270	46%
Carpenters	9.7	9,720	14,390	48
Deliverymen	11.7	9,060	12,720	40
Farm owners and tenants	10.5	7,780	15,910	104
Foremen	12.7	12,320	19,160	56
Heavy equipment mechanics	11.1	10,300	15,070	46
Managers and administrators, (not elsewhere classified)	13.8	16,770	26,040	55
Salesclerks, retail trade	12.7	6,470	9,480	47
Sales representatives, wholesale	13.8	13,690	21,030	54
Truck drivers	9.0	9,640	16,160	68
Occupations Employing Largest Number of Females:				
Bookkeepers	13.7	6,530	9,600	47
Cooks	9.1	5,470	8,570	57
Hairdressers and cosmetologists	13.0	5,770	8,650	50
Nurses aides	11.8	4,890	6,940	42
Practical nurses	13.2	5,870	8,910	52
Sales clerks, retail trade	12.7	6,470	9,480	47
Secretaries	13.9	6,860	10,100	47
Sewers and stitchers	8.5	4,880	6,970	43
Registered nurses	14.2	8,090	11,970	48
Typists	13.7	6,070	8,890	46
All U.S. Occupations	12.4	9,945	15,260	53

The earnings disadvantage in the fields employing large numbers of women is evident in the table. The educational achievement level in the mainly female occupations exceeded the economy-wide median of 12.4 years of schooling in 1970 in 7 of the 10 fields. The comparable figure in occupations employing large numbers of males was four. One of the occupations with a greater-than-average educational level, salesclerks in retail trade, is among the largest employers of both men and women. Full-year workers earned less than $8,000 in all but one of the fields listed in the female group, the exception being the registered nurses. The occupations listed in the male group were in this low earnings category in only two instances. One was the retail salesclerks included in both groups. In the three clerical fields listed, all with 1970 earnings of less than $7,000, the predominantly female work force had close to two years of post-high school education. Between 1970 and 1985, the differentials in earnings for the two groups of occupations are projected to increase. The average (unweighted) increase in the fields in the male group is estimated at 56 percent, and increases of 50 percent or more are projected in 5 of the 10 fields. The average increase in the female group is estimated at under 48 percent, and increases of 50 percent or greater are anticipated in only three fields. The increases in educational attainment for both men and women in the labor force, according to Department of Labor sources, are expected to be virtually identical in the next ten years, a rise by 1985 to 12.7 for men and 12.6 years for women.

Comparable information on the association between educational achievement and earnings in the occupations employing large numbers of blacks or other nonwhites would lack significance because a far smaller number of fields are predominantly nonwhite. These occupations are overweighted with unskilled and poorly paid positions, and many nonwhites are employed in other and more desirable jobs in which they make up a small percentage of the work force. Large differences in earnings for similar levels of educational achievement are apparent. In 1971, for example, the median income of Negro and other nonwhite families in which the family head had completed four years of high school was $8,165. The income for white families whose head had completed the same number of years of schooling was $11,460, or 40 percent greater. 1/

The association between educational attainment and earnings would be greater if discriminatory barriers based on sex or race did not diminish the economic gains from education for persons in groups with a disadvantaged labor market status. The fact of an association need not imply that increased exposure to schooling, by itself, is the cause of the higher earnings. More education can increase work skills, or improve the ability to read and write, to communicate, and to work together with people. In an economy in which educational credentials are often regarded by employers as a surrogate for ability to learn, or for potentially good work habits and motivation, absence of the appropriate credentials may

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1/ Statistical Abstract, 1973, p.331.

constitute a formidable obstacle to entrance into many desirable jobs. As the high school diploma becomes characteristic of the work force in most fields, especially among younger workers, possession of a full high school education will become more of a standard minimum qualification for employment than in the past. The high school diploma, however, is unlikely to provide the same assurance of employment or job mobility it did several decades earlier as persons with only a high school education come to find themselves increasingly in competition with job seekers possessing the same or higher educational qualifications.

IV.

The relationship between educational attainment and earnings is usually considered in terms of the association between years of schooling completed and earnings. But education can take place in many types of programs only some of which involve the established educational institutions. Since occupational education, in particular, is often provided outside of high school or post-secondary schools, many types of institutions provide education in the expectation that it will have an influence on earnings. A 1970 Census survey of occupational education programs indicates that a majority of the persons in virtually all occupational groups have learned their skills from sources other than completing a formal occupational training program. But program completers, excepting the graduates of four-year colleges, had higher earnings than the others in all occupational groups. The differentials were especially significant for persons with less than twelve years of schooling.

Occupational education for purposes of the Census survey included formal vocational programs in the public schools, or in a business, nursing, trade school, or technical institute, in apprenticeship programs, and training received in the Armed Forces or in the Job Corps. Correspondence courses, on-the-job training, and basic or officer military training, were excluded. The programs included in the Census study, therefore, take into account the types of training offered by the public vocational education system and they extend beyond it.

The largest representation of completers was among the professional and technical workers with 12 to 15 years of schooling, and the craftsmen and foremen in the same educational classification. Approximately half the persons in both groups were included among the completers. While the persons who enrolled in but did not complete one of the programs may have derived an economic benefit from their participation, the earnings of the completers who were not college graduates were greater than those who had never enrolled or finished in every occupational group. The college graduate group is excluded as a special case since persons in this group generally receive their occupational education in other types of programs.

The differentials in earnings between the program completers and the others are described in Table 3-8

Table 3-8

Median Earnings of Occupational Training Completers and All Others 1/ by Educational Attainment and Occupational Group, All Occupations, 1970 2/

	Median Earnings of Workers With Educational Attainment of:			
	Less Than 12 Years		12 to 15 Years	
By Occupational Group	Completed Occupational Training	All Others	Completed Occupational Training	All Others
Professional and technical workers	$7,999	$6,622	$ 8,532	$ 8,219
Managers and administrators, except farm	9,275	7,980	10,399	10,001
Salesworkers	6,450	5,173	7,644	7,095
Clerical workers	5,888	5,439	5,937	5,550
Craftsmen and foremen	8,737	7,503	9,659	8,729
Operatives, except transportation	6,622	5,550	7,365	6,407
Transportation equipment operatives	7,307	6,981	7,897	7,820
Laborers, except farm	6,008	5,501	6,854	6,667
Farm occupations	4,218	3,573	5,841	5,698
Service workers, except private household	4,554	3,779	5,398	4,744
Private household workers	1,513	1,158	1,523	1,223
All Occupations	6,868	5,642	7,756	6,943

1/ "All Others" category includes persons who did not enroll in or complete a formal occupational training program.

2/ Data are for persons 25-64 years old.

Source: U.S. Bureau of the Census, 1970 Census of Population, Subject Report, Vocational Training, 1973.

Both high school graduates and high school "dropouts" who finished a formal training program had greater earnings than those who did not participate in or complete such a program. The average earnings differential in all occupations between the completers and the others in the group which had never completed high school was considerably greater than the corresponding difference in the group with 12 to 15 years of schooling, approximately $1,200 in the "dropout" group as compared to slightly more than $800 for the high school graduates. In the group with less than 12 years of schooling, the gains favoring those who finished the programs were greatest for white-collar workers, other than clerical employees. The differential among high school graduates was largest for craftsmen and for operatives, excluding the transport operatives. The large differential in earnings favoring the program completers who lacked a high school diploma suggests that a formal training program often serves as a substitute for a full high school education in imparting work skills and habits or in obtaining a credential which can facilitate entrance into many desirable positions.

The Census survey is suggestive rather than conclusive. It does not attempt to allow for factors other than program completion which may affect earnings. It is likely that differences in motivation, learning ability, and socio-economic status between the completers and the others contribute to the differentials in earnings. The Census data do not make it possible to distinguish between the increase in earnings attributable to the acquisition of work skills and those attributable to the possession of a credential permitting access to better jobs. The large number of persons in the nonprofessional occupations who had never completed a formal vocational program indicates that completing these courses is seldom a prerequisite to employment. However, the consistency, as well as the magnitude, of the differential favoring the completers supports the contention that the persons finishing the programs derive an economic benefit from their participation.

The median years of schooling completed by the employed civilian labor force has increased from 10.9 years in 1952 to 12.1 in 1962 and to 12.4 in 1970. 1/ This long-term rise in educational attainment is important because of its bearing for earnings. The increases in educational attainment are also important because of their implications for human relations and the organization of authority within industry. In the late 1960's and early 1970's there was considerable concern that alienation from work was becoming translated into slower rates of productivity growth. While the extent of the alienation was difficult to assess, it was evidently a factor in recent major labor disputes in the automobile industry. Sar Levitan, an authority on the labor force, states in the title chosen for one of his recent works, Work is Here to Stay, Alas. 2/ Yet, it is reasonable to anticipate that the conditions under which it is performed will differ for a work force typically made up of persons with a high school education or something more than it was when the labor force was predominantly composed of high school "dropouts."

1/ Manpower Report of the President, 1975, p. 269.
2/ Levitan, S.A., and Johnston, W.B., Work is Here to Stay, Alas, Olympus Publishing Co., 1973.

CHAPTER 4

WOMEN AND NONWHITES

I.

The social and political changes since the early 1960's have brought about far-reaching changes in expectations about the economic role of women and nonwhites. These changes are symbolized by the civil rights movement, "women's lib," the equal employment legislation adopted by Congress and in many states, and the affirmative action programs introduced by large numbers of employers. Translating expectations into achievements hinges to a large extent on expanding the range of job options available to women or to blacks and other members of minority groups. While women and, more so, nonwhites have improved their economic status in the past decade, the changes to date have generally been modest. A continuation for another decade of the trends of the past ten or fifteen years in gradually modifying the occupational distribution for the two groups can be expected to generate a gap between aspirations and reality with significant consequences for the educational system, government, labor organizations, and private employers.

The drive for equal employment opportunity for women reflects underlying demographic, economic, educational, and social changes. Later age at marriage, declining birth rates, the greater prevalence of divorce, and more widespread educational opportunity have all reinforced the effects of changing social attitudes in increasing participation in the labor force by women. The impact of inflation in raising costs of living since the late 1960's has intensified these tendencies. Accordingly, the proportion of women in the 25 to 54 year age group who are in the labor force has increased from 37 percent in 1950 to 54 percent by 1974. By 1974, over two-fifths, 43 percent, of the married women whose husband was present were in the labor force. 1/

Approximately nine-tenths of the persons classified as "nonwhite" in the occupational statistics are blacks so that the job experience of blacks dominates this group. Much of the economic progress, and many of the labor market problems, facing blacks in the past generation represent the consequences of massive migration from the South to other parts of the nation. In the course of this movement, the black population has changed from a primarily rural to a primarily urban group, a change indicated by the increase in the urban component from 34 percent of the total black population in 1920 to 81 percent in 1970. 2/ Absence of skills in demand for nonwhites shows up in high unemployment rates as well as in low and decreasing labor market participation by nonwhite males. Unemployment rates for nonwhites have been approximately double or more the white rate for the past decade. More than a fourth of the male nonwhite teenagers and over a third of the females were unemployed in 1974. 3/

1/ Manpower Report of the President, 1975, pp. 57-58.

2/ Ibid, 1974, p.90.

3/ Ibid, 1975, p. 234.

Slightly over half of all women who were employed in 1970, 53 percent, and over two-fifths of the nonwhites were at work in the 123 occupations considered in the study. While evidence of change is apparent in these fields, many of the occupational shifts involving the two groups have taken place in other areas omitted from consideration either because of educational requirements, usually involving a full college education, or, at the other end of the occupational spectrum, an absence of job skills sufficient to minimize their potential for vocational training programs. The changes in the distribution for nonwhites and women in all occupations between 1960 and 1974 are summarized in Table 4-1. 1/

Table 4-1

Distribution of Employment, Nonwhites and Women, by Major Occupational Group, 1960 and 1974, All Occupations

	Percent Distribution of Employment			
	Women		Nonwhites	
Occupational Group	1960	1974	1960	1974
White-collar workers	55.3%	61.6%	16.1%	32.0%
Professional and technical workers	12.4	14.9	4.8	10.4
Managers and administrators, except farm	5.0	4.9	2.6	4.1
Salesworkers	7.7	6.8	1.5	2.3
Clerical workers	30.3	34.9	7.3	15.2
Blue-collar workers	16.6	15.5	40.1	40.2
Craftsmen and foremen	1.0	1.5	6.0	9.4
Operatives	15.2	13.0	20.4	21.9
Laborers, except farm	0.4	1.1	13.7	8.9
Private household workers	8.9	3.6	14.2	5.1
Other service workers	14.8	17.8	17.5	20.0
Farm occupations	4.4	1.4	12.1	2.7
Total	100.0%	100.0%	100.0%	100.0%

Note: Details may not add to totals due to rounding.

Source: Manpower Report of the President, 1975, pp. 226, 228.

1/ For a different analysis of the occupational participation of women and black workers, see Garfinkle, S., "Occupations of Women and Black Workers," Monthly Labor Review, November, 1975, pp. 25 f.f.

The occupational shifts for nonwhites, as indicated by the major groups, have been more extensive than those for women. One of the most striking changes for both groups has been the sharp fall-off in employment in private household work, a field dominated in the past by black women. Growth in employment in white-collar occupations, especially in professional and technical and clerical fields, constituted a major change for nonwhites. All told, the percentage of nonwhites employed as white-collar workers doubled between 1960 and 1974, increasing from a sixth to nearly a third of the total employment. The decline in employment in the farm occupations for both women and nonwhites was greater than the drop in overall employment in this field. Continuing past trends, the proportion of women employed as clerical workers increased between the two years.

Allowing for many individual instances of occupational breakthroughs, a continuation of the experience of the past ten or fifteen years in the fields considered in the study would result in the bulk of the employment increases for women taking place in occupations in which females already predominated. The largest single increase between 1970 and 1985 would take place in clerical occupations, a growth in employment estimated at 3.7 million. The changes anticipated for nonwhites would represent a more general upgrading of occupational skills, especially in white-collar, service, and skilled craft fields. Part of this shift would be concentrated in less well paid but higher social status white-collar positions. For example, the largest single increase in representation projected for nonwhites in the occupations studied is for secretaries.

Because of their limited access to the more desirable job opportunities, women and nonwhites share common problems of low earnings. In 1970, for instance, over three-fourths of the women and more than half of the nonwhites employed in the study occupations were at work in fields which paid full-year workers under $8,000 a year, or approximately $2,000 or more below the median earnings for all year-round workers in that year (see Table 1-7). The common problem of access to opportunity is illustrated by the representation of women and nonwhites in the ten highest paying and the ten lowest paying occupations, according to their 1970 earnings, among the 123 considered in the study. Their actual representation in 1970 and the projected representation in 1985 are summarized in Table 4-2.

Table 4-2

Representation of Women and Nonwhites in Ten Highest and Ten Lowest Paying Occupations Included in Study, 1970 and Projected 1985

Occupation	Percent Female 1970	Percent Female 1985	Percent Nonwhite 1970	Percent Nonwhite 1985
Ten highest paid:				
Stock and bond sales agents	8.6%	12.5%	2.2%	3.7%
Managers and administrators, not elsewhere classified	11.6	11.0	2.8	4.0
Bank officials and financial managers	17.4	23.5	2.5	4.2
Sales representatives, manufacturing	8.5	5.7	1.8	3.2
Real estate appraisers	4.1	8.7	2.0	2.2
Designers	23.5	30.3	4.4	7.7
Personnel and labor relations workers	31.2	28.7	6.4	8.8
Sales representatives, wholesale	6.4	9.9	2.0	3.4
Computer programmers	22.7	18.7	5.5	7.5
Mechanical engineering technicians	2.9	7.3	3.0	5.6
Ten lowest paid:				
Practical nurses	96.3	97.8	23.5	30.4
Hairdressers and cosmetologists	90.4	92.4	8.3	5.6
Cooks, except private household	62.8	60.4	22.3	18.6
Health aides, except nursing	83.9	79.2	20.8	22.5
Nurses aides	84.6	88.9	26.5	28.5
Sewers and stitchers	93.8	93.5	12.1	21.3
Farm laborers	13.2	17.4	22.6	14.3
Dressmakers and seamstresses	95.7	94.2	12.2	17.0
School monitors	91.2	95.8	8.0	10.0
Chilicare workers, except private household	93.2	88.4	16.6	20.0
All Study Occupations	35.9	40.5	8.1	10.3
All Occupations	37.7	39.0	10.7	12.4

Source: See Table 2-7.

The projections show that if the developments of the past ten or fifteen years continue, women would be better represented by the mid-1980's in most of the higher paying fields. A larger proportion of the stock and bond salesmen, to cite an instance, would be females, and women would make up a larger percentage of the bank officials, designers, or mechanical engineering technicians. The representation of blacks and other nonwhites is expected to increase in all of these fields. Offsetting this evidence of progress toward greater equality of opportunity, the percentage of women or nonwhites in all of the higher paying fields in 1985, as in 1970, would be less than their representation in all the study occupations or in the overall employed work force. Similarly, women would be overrepresented in nine of the ten low-paying fields in the 1980's and nonwhites in eight. If more detailed breakdowns were available, it is likely that they would show the least favored group to be made up of the individuals with a double labor market disadvantage, nonwhite women.

The historical data and the projections dealing with nonwhites and women point to a problem and a challenge rather than presenting a forecast of what the future must hold. The problem arises from the gap between the social and political goals which have enlarged aspirations and the slow progress in translating the aspirations into greater opportunity in the labor market. In this sense, the projections reflect the implications of recent developments, and they would become outmoded as the educational system, employers, and government proceeded to transform the aspirations into a closer approximation to reality.

II.

Job opportunities for women in the next ten years are more likely to arise out of employment growth and replacement needs in fields in which women are already well represented than from large-scale penetration into new fields. Much of the basis for this anticipation stems from the tendency for younger women, the newer entrants into the labor force and the group most affected by the recent changes in social attitudes, to enter the same or similar fields as do all women.

The employment of women is concentrated in a small number of occupations. In the occupations considered in the study, close to half of the women workers, 45 percent, are expected to be employed in five fields in 1985, seven-tenths in 13 fields, and five-sixths in 34. This tendency toward concentration of employment is illustrated in Table 4-3. An occupation is considered "female" for the purposes of the table if 50 percent or more of the persons employed in it are women.

Table 4-3

Employment of Women in "Female" Fields Included in Study Occupations, 1970 and Projected 1985

Item	1970	1985
Total employment of women in occupations studied (in thousands)	15,585	23,191
Employment of women in "female" occupations (in thousands)	12,195	19,186
Percent of female employment in "female" occupations	78%	83%
Number of "female" occupations	31	34
Total number of occupations studied	123	123

Source: See Table 2-7.

The "female" occupations include such fields as nursing and health service jobs, most clerical positions, retail salesclerks, operatives jobs, such as dressmakers or sewers and stitchers, and service occupations connected with personal care, child care, or food service. Barriers to entry in many occupations together with the persistence of stereotypes defining what are appropriate "men's jobs" and "women's jobs" lead women to seek employment in a relatively narrow range of occupations. Overcrowding in these fields serves to increase the supply of qualified workers and, in this way, to depress earnings. The availability of large numbers of women with better-than-average educational credentials, i.e., secretaries or bookkeepers, often leads employers to stress educational qualifications as a weeding out device in hiring. Because women leave the labor force more frequently than men, typically to rear young children, a common feature of the predominantly "female" occupations is a high ratio of job openings arising from replacement needs as compared with employment growth.

The changes projected in the occupational distribution for women in the 1970 to 1985 period can be illustrated by the representation shifts projected in different fields. These shifts consist of the part of the employment growth expected to arise because of an increase in the proportion of women in the occupations studied. All told, representation shifts are estimated to account for about a seventh of the total employment growth for women in the occupations considered in this period. The representation shifts are described for major occupational groups in Table 4-4.

Table 4-4

Estimated Changes in Employment and Representation Shifts for Women, Occupations Included in Study, 1970 to 1985
(in thousands)

Occupational Group	Employment 1970	Employment 1985	Change in Employment, 1970-1985	Change Due To Representation Shifts, 1970-1985
Professional and technical workers	968	1,595	627	26
Managers and administrators, except farm	881	1,152	271	-68
Salesworkers	1,759	2,530	771	221
Clerical workers	6,363	9,733	3,370	307
Craftsmen and foremen	306	568	262	177
Operatives	2,163	2,725	562	231
Service workers	2,924	4,745	1,821	157
Laborers, except farm	18	28	10	11
Farm occupations	200	116	-84	18 a/
Total	15,585	23,191	7,606	1,081

a/ Although employment for women in the farm occupations is expected to decline between 1970 and 1985, there is a positive representation shift for women in this field because the proportion of the total employment made up of women is projected to increase from 7.5 to 8.7 percent.

Source: See Table 2-7.

Note: Details may not add to totals due to rounding.

Women can be expected to increase their representation in most fields in the next ten years because they will make up a larger share of the labor force. The largest single employment gains are listed for the clerical occupations. Over two-fifths, 44 percent, of the total employment increase for women is projected to arise in this one field. Women will typically make up a slightly larger percentage of the work force in most clerical fields in the mid-1980's. Their representation is expected to increase in the few clerical fields which had predominantly employed males in the past. Shipping and receiving clerks or stock clerks are examples. Offsetting these instances, 97.6 percent of the secretaries were women in 1970 as were 94.2 percent of the typists. These percentages are expected to grow to 98.6 percent by 1985 for secretaries and to decline to 93.2 percent for typists. Aside from the clerical occupations, women would increase their representation in operatives jobs. Bus drivers, especially those employed in driving school buses, are an instance. A somewhat smaller proportion of women would be at work in managerial fields, such as buyers in department stores. But women would make significant representation gains in individual managerial and administrative positions, i.e., as bank officials and financial managers. Representation shifts make up over two-thirds of the employment increase listed for the skilled crafts. However, after allowing for many individual breakthroughs by women in these fields, the increase in female penetration in skilled crafts, such as auto mechanics or electricians, would be small. To cite an instance, employment for women as air conditioning, heating, and refrigeration mechanics is projected to increase by 400 percent between 1970 and 1985. This would represent a growth from about 1,000 to 5,000 women at work in an occupation employing 130,000 persons in 1970. Overall, slightly less than three percent of the growth in employment projected for women in the study occupations represents growth as craftsmen or foremen.

Part of the explanation for the modest representation shifts for women is that the newer entrants into the labor force tend to enter the same fields that all women have been employed in for the past few decades. The significance of the tendency for younger women to perpetuate the prevailing occupational distribution by entering what are already predominantly female fields can be summarized with reference to the ten occupations included in the study in which women made up 90 percent or more of the employed work force in 1970 (see Table 4-5).

Table 4-5

Representation of All Women in Work Force, 1970 and Projected 1985, and Representation of Women in Under-35 Work Force, 1970, Selected Occupations

Occupation a/	Percent of Work Force Made up of Women, 1970	Percent of Work Force Under 35 Made up of Women, 1970	Percent of Work Force Made up of Women, 1985
Registered nurses	97.4%	97.2%	97.2%
Secretaries	97.6	98.4	98.6
Calculating machine operators	90.8	84.4	80.3
Stenographers	93.4	98.0	90.1
Typists	94.2	94.1	93.2
Dressmakers and seamstresses	95.7	91.5	94.2
Sewers and stitchers	93.8	93.0	93.5
Childcare workers	93.2	92.2	88.4
Hairdressers and cosmetologists	90.0	90.6	92.4
Practical nurses	96.3	96.0	97.8

a/ Women made up more than 90 percent in the school monitors field in 1970. This occupation has been omitted because of apparent inconsistencies in the data.

Sources: U.S. Bureau of the Census, 1970 Census of Population, Occupational Characteristics; Special Tabulations, 1970 Census Public Use Tapes.

The comparison between women under 35 and all women is a gross one since women under 35 made up close to two-fifths of the total female labor force in 1970. Yet, the pervasiveness of the tendency for younger women to continue in the fields regarded as "female" is evident in the table. In nine of the ten occupations listed, at least nine-tenths of the work force under 35 was female. As the younger entrants into these fields continue to enter the "female" fields, they increase the likelihood that similar patterns will prevail in the next decade. Accordingly, women are projected to make up nine-tenths or more of the work force in eight of the ten occupations in the mid-1980's and at least four-fifths in the other two. The fields in which women are heavily overrepresented are typically characterized by low earnings. The propensity of younger women to continue in the steps of their predecessors helps to perpetuate low earnings by assuring a steady stream of new entrants added to the supply of labor in these occupations.

Women already in the labor force frequently lack either the skills or the credentials to enter new and better paying fields. For example, married women over 35 have typically left the labor force to rear a family. They then seek to return after an absence in which their job skills have often become obsolete or suffer from disuse. Moving away from the traditional stereotypes of "women's jobs" and reversing the process that embodies the stereotypes in the prevailing occupational distributions would involve creating new types of institutions and programs geared to the needs of adult women in the labor force. They would place a greater emphasis on "lifetime learning" in the schools, on counselling for second careers, and on company and publicly supported training and upgrading programs for adults who are locked into a narrow range of job skills and options.

III.

The manpower indicators for nonwhites, like the experience of the past ten or fifteen years, suggest more extensive occupational shifts in the coming decade than do the comparable indicators for women. In addition, the stereotype of the nonwhite labor force as one largely made up of high school dropouts will come to represent a marked departure from reality as nonwhites achieve a rough parity with whites in the extent to which their employment becomes concentrated in occupations with a work force largely composed of high school graduates. Allowing for the occupational shifts and the greater educational attainment, continuation of the trends of the recent past imply that a sizeable majority of the nonwhites will be employed in low-paying fields. The anticipation of slow progress in changing the distribution of earnings reflects several considerations. One is the expectation that nonwhites will continue to be overrepresented in less skilled fields. Another are the indications that much of the upgrading in occupational status for nonwhites will be unaccompanied by comparable increases in earnings. For instance, the largest amount of upgrading will take place in the clerical area, a relatively lowly paid white-collar field.

Blacks and other nonwhites will be more heavily represented in most occupations in the coming decade because they will make up a larger share of the labor force. The civilian labor force increase projected for nonwhites in the 1970 to 1985 period, for example, amounts to 49 percent as compared to 27 percent for whites. About eight percent of the persons employed in the study occupations were nonwhites in 1970. The comparable proportion for 1985 is slightly over ten percent. These figures are less than the representation of nonwhites in total civilian employment due to the substantial representation of nonwhites in many unskilled fields and in some professions which are not included among the occupations considered in the study.

Employment for nonwhites in the study occupations is projected to grow by nearly 2.4 million between 1970 and 1985. Two types of impacts are associated with the employment growth. One, and the more far-reaching, will take the form of an increased representation in most of the fields considered. Close to three-fifths, 57 percent, of the employment growth in this period is expected to take the form of representation shifts. The other, a less marked change, will make itself evident in a change of the occupations in which nonwhites are employed so that the nonwhite occupational distribution will come to more closely approximate the white distribution.

The representation shifts for nonwhites are especially evident in the clerical and sales fields, and among skilled craftsmen. The shifts are described in Table 4-6.

Table 4-6

Changes in Employment and Representation Shifts for Nonwhites, Occupations Included in Study, 1970 to 1985
(in thousands)

Occupational Group	Employment 1970	Employment 1985	Change in Employment, 1970-1985	Change Due To Representation Shifts, 1970-1985
Professional and technical workers	145	380	235	128
Managers and administrators, except farm	176	338	162	95
Salesworkers	164	342	178	126
Clerical workers	553	1,180	627	401
Craftsmen and foremen	522	980	458	314
Operatives	792	1,232	440	282
Service workers	761	1,245	484	56
Laborers, except farm	141	122	-19	-12
Farm occupations	257	64	-193	-56
Total	3,511	5,879	2,368	1,338

Note: Details may not add to totals due to rounding.

Source: See Table 2-7.

The increase in employment in the occupations considered, about two-thirds, is greater than the projected 49 percent growth in the nonwhite labor force in the 1970 to 1985 period. This suggests that in the coming decade a larger percentage of the nonwhites will be employed in fields in which the vocational education system offers preparation, or in nonprofessional occupations involving some degree of skill. Many of the largest representation shifts are projected to take place in fields in which nonwhites have historically been represented in excess of their proportion in the overall labor force. Nurses aides, practical nurses, and sewers and stitchers are instances. Typically, these are low-paying fields. Some of the other occupations with marked representation shifts, e.g., clerical positions, are low-paying white-collar positions whose occupational and social status is relatively high. The greater representation in craftsmen and foremen positions underscores a growth area characterized by greater-than-average earnings and also by an upgrading of occupational status. Both the number and the proportion of nonwhites employed in two low-skilled and poorly-paying fields, nonfarm and farm laborers, is expected to decline.

Over half of the employment increase for nonwhites, and many of the major representation shifts, are projected to take place in eleven occupations. Seven of these fields paid full-year workers under $8,000 or approximately $2,000 or more below the economy-wide median for these employees in 1970 (see Table 4-7).

Table 4-7

Projected Increase in Employment for Nonwhites, 1970 to 1985, Selected Occupations

Occupation	Expected Increase in Employment, 1970-1985 (in thousands)	Median Earnings, 1970
Registered nurses	67	$ 8,090
Managers and administrators, not elsewhere classified	113	16,770
Salesclerks, retail trade	106	6,470
Bookkeepers	74	6,530
Secretaries	201	6,860
Typists	126	6,070
Foremen	83	12,320
Sewers and stitchers	111	4,880
Welders and flame cutters	67	9,640
Nurses aides	167	4,890
Practical nurses	167	5,870
Increase in Eleven Occupations	1,282	
Increase in All Study Occupations	2,368	
Increase in Eleven Occupations as Percent of Increase in All Study Occupations	54%	

The largest employment increase listed for nonwhites in any of the individual fields considered is the one for secretaries, and the next two largest are for nurses aides and practical nurses. Sizeable growth is also projected in two more highly paid occupations, miscellaneous managers and administrators, and foremen. However, the miscellaneous managers category includes many dissimilar types of positions with large differences in earnings so that the median earnings figure for the entire occupation may be misleading for any one group. Three of the occupations in the table are clerical fields, and one, registered nurses, reflects greater penetration in a professional occupation in which nonwhites have been well represented in the past. Overall, the expected areas of growth underscore the prospect of an upgrading in occupational status accompanied by less rapid changes in earnings levels.

The expected increases and decreases in employment for nonwhites parallel those for whites but the percentage changes are generally considerably larger for members of minority groups. For instance, employment for white craftsmen and foremen in the study occupations is expected to increase by a fourth between 1970 and 1985. The comparable increase for nonwhites is seven-eighths. But, after allowing for the more rapid growth for nonwhites, about a sixth of the blacks and other nonwhites would be at work as craftsmen and foremen in the 1980's. This compares with nearly a fifth for whites. Within the skilled crafts, nonwhites would be well represented in less specialized or heavy construction crafts such as brick and stonemasons, bulldozer operators, or painter apprentices. There would be relatively few at work as electricians, photoengravers, plumbers, or structural metal craftsmen.

For nonwhites who are in the labor force, isolation from the mainstream of the more desirable jobs is one of the underlying reasons for low incomes. This isolation helps explain the presence of millions of "working poor" or near-poor in periods of full employment. The earnings from some full-time jobs in which blacks are overrepresented are little more than could be obtained by family heads without working from welfare assistance programs. In terms of the study occupations, the effects of isolation are evident in the figure showing that three-tenths of the nonwhites at work in these fields in 1970 were employed in occupations which paid under $6,000 to persons who worked 50 weeks or more during the year (see Table 1-7). Several developments in the coming decade are likely to diminish, although probably not to eliminate, the isolation. One is the declining proportion of nonwhite workers, those under 35, entering many of the least skilled and most poorly paid fields. This development contributes substantially to the expected decline in the proportion of nonwhites employed as laborers or farm laborers (see Table 4-6). On an economy-wide basis, the tendency of the younger nonwhites to avoid the least desirable fields also helps to explain the sharp fall-off since 1960 in the employment of blacks and other minority group members in private household workers (see Table 4-1).

Rapid growth in occupations offering attractive career prospects can also be important in creating opportunities for lessening the concentration of nonwhites in the less desirable jobs. Discriminatory barriers are less formidable and well-established in most expanding fields and most, especially the technical and equipment repair positions, provide better-than-average earnings to the persons employed in them. Nonwhites are expected to increase their representation in all of the most rapidly growing fields, those in which increases in employment of 100 percent or more are projected between 1970 and 1985 (see Table 4-8).

Table 4-8

Representation of Nonwhites in Study Occupations With Projected Employment Increases of 100 Percent or More, 1970 to 1985

Occupation	Percentage of Employment Made Up Of Nonwhites In: 1970	1985
Therapists	8.4%	10.4%
Practical nurses	23.5	30.4
Health aides, except nursing	20.8	22.5
Electrical and electronic engineering technicians	5.2	8.2
Engineering and science technicians, not elsewhere classified	5.2	9.1
Other technicians, except health	7.5	10.5
Data processing machine repairers	3.1	3.7
Air conditioning, heating, and refrigeration mechanics	4.6	7.6
All Study Occupations	8.1	10.3

Source: U.S. Department of Labor, Bureau of Labor Statistics, Occupation-by-Industry Matrix Projections for 1985, (unpublished), 1974.

The concentrations of nonwhites in the high growth occupations are expected to remain high in health service fields characterized both by rapid growth and low earnings. However, nonwhites are projected to increase their representation in many of the rapidly growing technical specialties to approximately their overall proportion in the study occupations. The rapidly growing fields related to technological advance or medical technical therapies are expected to offer many opportunities to members of minority groups, as well as others, with the education and training to enter them.

The occupations in which most nonwhites were employed in the past were characterized by low educational attainment, a condition frequently associated with unskilled work and low earnings. This characterization had become less than an accurate description by 1970, and it will be even less valid by 1985. The projections indicate that by 1985 more than seven-tenths of the nonwhites will be employed in occupations in which more than a majority, at least three-fifths, of the work force will have completed between 12 and 15 years of schooling. This compares with less than a fourth in 1970. By the mid-1980's nonwhites will have achieved parity with whites in their representation in the generally more skilled fields in which four-fifths of the work force are high school graduates but with less than a full college education. The anticipated changes in the educational makeup of the occupations in which whites and nonwhites are employed are summarized in Table 4-9.

Table 4-9

Distribution of Employment by Race, Grouped by Percentage of Occupational Work Force Completing 12 to 15 Years of Schooling, Study Occupations, 1970 and Projected 1985

Percent Completing 12-15 Years of Schooling	1970		1985	
	White	Nonwhite	White	Nonwhite
Under 20	0.0%	0.0%	0.0%	0.0%
20 - 39.9	22.6	36.3	2.9	4.4
40 - 59.9	45.6	40.3	19.7	24.2
60 - 79.9	19.2	13.9	51.8	45.8
80 - 100.0	12.6	9.5	25.6	25.6
Total	100.%	100.0%	100.0%	100.0%

Note: Details may not add to totals due to rounding.

Sources: U.S. Bureau of the Census, 1970 Census of Population, Occupational Characteristics; U.S. Department of Labor, Bureau of Labor Statistics, Occupation-by-Industry Matrix Projections for 1985, (unpublished), 1974.

The projections show both the influence of occupational upgrading for many nonwhites in the coming decade and the overall advance in the educational attainment level of the work force. By the mid-1980's, blacks and other nonwhites will have made substantial inroads in the occupations in which most workers have a high school education or more. However, the shifts toward greater parity in educational attainment are unlikely to be accompanied by a comparable advance toward greater parity in earnings since much of the occupational upgrading will take the form of greater employment in jobs in which high educational attainment and relatively low earnings go together. Clerical fields and professional nursing are instances. In addition, increases in educational attainment have been especially marked in the occupations involving minimum skill and, in the past, a high representation of high school dropouts. Many operatives, service, and laborers fields are examples. These occupations have provided the bulk of the employment for nonwhites. Accordingly, for nonwhites, as for women, the economic return to more schooling has frequently been less than for white males.

Concern with equality of opportunity for nonwhites and women has focussed on three areas. They are assuring equal pay for the same work, reducing the high unemployment rates characterizing both groups, and eliminating discriminatory barriers in employment. Shifting the occupational distributions for the two groups in the coming decade is an underlying issue in all of these areas. Equal pay for the same work would represent scant improvement if most women and nonwhites continue to be confined to occupations at the lower end of the earnings distribution. To a considerable extent, the high unemployment rates for the two groups are a consequence of the concentration of their job prospects in less skilled, poorly paid, and unemployment prone fields. The objective in eliminating discriminatory barriers in hiring and upgrading is to open up new and more desirable types of job opportunities which had been closed before. The criterion of success of education or training, or equal employment programs, for members of groups with a disadvantaged labor market status, therefore, is the extent to which they succeed in changing the occupational distribution of employment to something different from a continuation of past trends.

CHAPTER 5

IMPLICATIONS FOR EDUCATIONAL AND MANPOWER PLANNING

I.

The overriding significance of the manpower indicators are their implications for priorities and planning in vocational education. The present vocational programs are educational programs, manpower programs, and social programs. A greater emphasis on one of these objectives is likely to be accompanied by a lesser emphasis on the others. However, it is the manpower orientation of vocational education which distinguishes it from other educational programs.

The federally-supported vocational education system is only one, although the largest, of a number of channels by which training can be acquired for occupations which do not usually require a four-year college degree for admission. For persons who are already employed, much training is acquired on the job, often in company-sponsored programs. Apprenticeship programs are an important training resource in many skilled crafts, particularly in the building trades. The continued existence of private vocational schools is a testimonial to the desire of large numbers of people to gain specific occupational training through a formal program. In recent years, community colleges have greatly expanded the scope of the occupational training they offer. The massive growth of the Federal Government's remedial manpower training programs for adults in the past decade underscores the importance attached by the nation to programs for enhancing earning capacity and employability as a remedy for the poverty of persons who are, or who could readily be, in the labor force. The specific feature differentiating the vocational education programs is that they offer occupational instruction provided by professional educators in a school context mainly, but not exclusively, to young persons who are not yet in the labor force.

Vocational education is often regarded as "career preparation" with the implied concept that an individual attending school is preparing for a specific lifetime career, or to enter the first rung of a well-defined career ladder. While this preconception is often valid in skilled craft, technical, and professional occupations, it overlooks the large elements of flexibility and inter-occupational mobility which characterizes the work force. For example, beginning with the first position held for at least six months, the typical member of the labor force without a college education, to cite one study, holds twelve different jobs during a 46-year working life. Only one man in five in this group can anticipate remaining in the same major occupational category for his entire life. 1/ The education and training that is significant for these people would stress increasing the options available to individuals in a changing society rather than primarily training them for a first or a second job. Occupational education, from this perspective, is important because it imparts skills and techniques, including communication skills, and an

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1/ Wilensky, Harold L., "Careers, Counselling, and the Curriculum," The Journal of Human Resources, Winter, 1967, p. 32.

orientation to the world of work. In an increasingly mobile and impersonal society, vocational education also provides the entrance credentials needed to qualify for a job. Possession of the credentials, according to a noted European labor market authority, Nils Kellgren, has come to mean "placing a label on a person." With this label, "he is invited to the working life and is accepted." 1/ These considerations emphasize the special role of vocational education in bridging the gap between school and work.

II.

Continuation of the recent program priorities in vocational education in the coming decade would imply that the system remain an important source of trained employees in some fields, such as office occupations, and a lesser source in many of the better-paid white-collar and technical fields. While the anticipated increases in enrollment in the coming decade are frequently roughly similar to the expected changes in employment, the projections indicate imbalances between enrollments in the programs and job opportunities in closely related fields in such areas as distributive education and the agricultural programs.

The relationship between enrollment and employment in the occupations studied can be expressed in terms of the "penetration rate," a ratio showing the enrollment per 100 persons employed in the occupations related to the different vocational education program areas. The data for 1970 underscore the marked differences in penetration in individual areas (see Table 5-1).

1/ Kellgren, Nils, "An Active Labor Market Policy," Memorandum to the Secretary of Labor, 1963, p. 61.

Table 5-1

Enrollment in Vocational Programs Per 100 Persons Employed in Related Study Occupations, 1970

Program Area	Enrollment Per 100 Persons Employed in 1970
Agriculture	23
Distributive education	3
Health occupations	7
Home economics (gainful)	6
Office occupations	22
Technical occupations	20
Trades and industry	10
All areas	11

Sources: U.S. Office of Education, Trends in Vocational Education Fiscal Year 1972, Vocational Education Information, No. 2, 1973; U.S. Bureau of Labor Statistics, "Matching 1970 Census-Based BLS National-State Matrix Occupational Categories to Office of Education Instructional Programs," (unpublished), 1974.

An average of eleven persons were enrolled in vocational programs in 1970 for every 100 persons employed in the related occupations. However, the enrollment ratio was only three in the distributive education programs, courses often regarded as preparation for employment in the merchandising field, while the rate was twenty-two in the office occupations programs and twenty-three in the agricultural programs. The penetration rate was also high in the technical programs, courses which frequently prepare young persons for employment in various technical specialties, such as electronics.

Interpretation of the penetration rate data or other enrollment figures in the federally-supported vocational programs requires qualification on several grounds. In many fields, i.e., secretarial work or computer programming, private institutions are an important source of supply and their contribution must be taken into account in appraising the enrollment data in the public vocational programs. Community colleges provide vocational instruction in many of the better-paid white-collar and technical areas without receiving federal support. The vocational programs also differ considerably in the extent to which their programs constitute preparation for employment in specific fields closely related to the training. According to a recent study of occupational education in the public post-secondary schools and in private proprietory institutions, only a fifth of the graduates of the accounting programs obtained jobs as accountants or in related fields. Less than a fourth of the graduates of the computer programming courses were employed in programming or in closely related areas. Most of the persons receiving training as dental assistants, secretaries, or cosmetologists, on the other hand, took positions related to their training. 1/ Moreover, in interpreting this data, allowance must be made for the fact that graduates of programs, such as accounting or computer programming, may obtain employment in entry level occupations considerably below the skill level for which they have been trained and, in this way, obtain the necessary experience to qualify for employment more closely related to their training at a future date.

Another way of assessing priorities in vocational education as they relate to manpower considerations is to compare the anticipated changes in enrollments with the projected changes in employment. Consideration of changes over time is important because shifts in priorities usually require the passage of time to become implemented since existing facilities, equipment, and tenured faculty must be directed to new fields. The anticipated changes in enrollment are evident in the historical information for 1970 and the projections for 1977. The 1977 data are Office of Education projections. They refer to enrollments in the vocational programs related to the occupations considered in the study, about 85 percent of the total vocational enrollments projected for 1985. The employment data indicate the actual employment in these occupations in 1970 and the anticipated employment in 1985 (see Table 5-2).

1/ Wilms, Wellford W., Public and Proprietory Vocational Training, University of California at Berkeley, 1974, p. 173 ff.

Table 5-2

Distribution of Enrollments in Vocational Programs Related to Occupations Included in Study, 1970 and Projected 1977; and Distribution of Employment in Study Occupations, 1970 and Projected 1985

Program Area	Percent Distribution of: Enrollment 1970	Enrollment 1977	Employment 1970	Employment 1985
Agriculture	15.8%	9.1%	7.4%	3.4%
Distributive education	6.5	8.7	26.0	27.0
Health occupations a/	3.1	3.9	4.8	6.3
Home economics (gainful)	2.7	5.9	4.5	4.3
Office occupations	40.8	31.0	19.4	21.7
Technical occupations a/	2.5	1.8	1.3	2.1
Trades and industry	28.7	39.6	29.3	28.7
Other	-	-	7.3	6.5
Total	100.0%	100.0%	100.0%	100.0%

a/ The vocational program enrollments listed in the table relate only to the occupations included in the study.

Sources: See Table 5-1 and U.S. Bureau of Labor Statistics, "Occupation-by-Industry Matrix Projections," (unpublished), 1974.

Note: Details may not add to totals due to rounding.

The most striking increase in the projections is the growth in enrollments in the trades and industry programs. These are courses preparing persons for employment, largely in private industry, in fields such as metal working, electrical or electronic trades, or in the building trades. More rapid growth in enrollments in this program area than in the employment in related fields suggests a marked increase in the enrollment-employment ratio in the coming decade. Enrollments in distributive education courses preparing young persons for employment in jobs relating to merchandising, although increasing, would still be relatively less important in the next five or ten years than the job openings in these fields. The decline in the share of enrollments in the office education programs would represent a fall-off to a proportion still greater than but more nearly equal to the projected job openings in the field.

A large and complex imbalance exists between enrollments in the agricultural programs and the related employment. The percentage of vocational enrollments in the agricultural courses is projected to fall off significantly between 1970 and 1977, indicating a change in the priority given to this area. With this relative decline, enrollments in the agricultural programs would be 50,000 larger in 1977 than in 1970. The employment concept used in the comparison refers directly to the farm-related occupations. Expanding the concept to include the entire agriculture industry would raise the projected employment level by slightly less than 20 percent. However, employment in the agriculture industry is expected to fall from 3,450 in 1970 to 1,900 in 1985. 1/ Including the closely related agribusiness occupations would increase the employment figures further. 2/ However, the expectation that a growing number of students in the agricultural programs will obtain employment in the agribusiness field selling supplies or repairing equipment, in the dairy industry, or distributing farm products, requires tempering in the light of the expected decline in the share of GNP originating in agriculture in the coming decade. While output in agriculture will probably continue to increase slowly, the percentage of the Gross National Product originating in this sector of the economy is projected to decline, according to U.S. Department of Labor sources, from 3.5 percent of the total in 1970 to 2.1 percent in 1985. 3/ The decline in the relative importance of agriculture in the economy, together with the high rates of productivity growth in this area, imply that employment in fields closely related to agriculture will provide jobs for a smaller segment of the labor force in the next decade than in the past one.

1/ Manpower Report of the President, 1975, p. 203, 314.

2/ For a presentation of the agribusiness occupations see National Committee on Employment Opportunities and Training Needs in Agribusiness, Employment in Agriculture and Agribusiness Occupations, Economic Research Service, U.S. Department of Agriculture, 1974.

3/ U.S. Department of Labor, Bureau of Labor Statistics, The U.S. Economy in 1985, Bulletin 1809, 1974, p. 36.

III.

The relationship between the expected enrollment changes and job openings indicates an effort, with some exceptions and inconsistencies, to bring enrollments and job openings more closely into balance in the coming decade. The program concentrations also suggest a need for giving consideration to earnings prospects equivalent to that given to job openings in determining program priorities.

The emphasis on earnings in program planning is illustrated by the penetration rates in 1970 in programs related to the occupations included in the study with high and low earnings. These data are presented in Table 5-3. "High" in the comparison refers to occupations in which the median earnings of full-year workers in 1970 were at least 25 percent above the corresponding median for all occupations. "Low" refers to occupations with a 1970 median of at least 25 percent below the national figure.

Table 5-3

Enrollment-Employment Ratios in Programs Related to Occupations with High and Low Earnings, 1970

Program	Enrollment Per 100 Persons Employed in Related Occupations in 1970
Programs Related to High Earnings Fields:	
Finance and credit	4
General merchandising Apparel and accessories	2
Hardware and building materials Industrial marketing	1
Personnel, training, and related programs	3
Programs Related to Low Earnings Fields:	
Agricultural production	22
Landscaping	9
Practical nursing	16
Nurses assistant	6
Medical assistant	3
Care and guidance of children	8
Clothing management Dressmaking Home furnishings	8
Accounting and computing	17
Stenography and secretarial	16
Typing	57
Cosmetology	8
Quantity food preparation	2
All Programs Studied	11

Source: See Table 5-1.

There are more programs related to occupations which yield below-average earnings than there are programs offering preparation for jobs in fields with above-average earnings. Enrollments in the low paying fields are generally a larger proportion of the employment in related occupations than in the high paying fields. For instance, in the finance and credit programs offering training leading to employment in financial institutions, the vocational programs enrolled only four students for every 100 persons employed in these fields. The enrollment ratios were often several times greater in the programs preparatory to employment in occupations with below-average earnings. The two highest penetration rates were in the typing and agricultural production programs suggesting that these programs serve a variety of interests in addition to training for the specific occupations directly related to them. The low penetration rates in the higher-paying, largely white-collar, fields imply a reluctance by the vocational education system in the past to assign a heavy emphasis to programs whose graduates would frequently compete for jobs with persons possessing more elaborate educational credentials. However, the projections of enrollment and employment growth indicate an increase in enrollment-employment ratios in both well paying and poorly paying fields. If both the enrollment and the employment projections were to materialize, much of the shift in enrollments would be from programs related to occupations with earnings significantly below the overall median to occupations more closely approximating the national average.

In the rapidly growing occupations, fields largely concerned with technological advance and health services, the penetration rates of the vocational programs are typically high with the exception of some of the health fields (see Table 2-4). Enrollment ratios are expected to grow in the fields in which employment is projected to increase by 100 percent or more during the 1970 to 1985 period. The increases indicate that the vocational programs are likely to increase their share of the market in these high growth fields in the coming decade. Aside from the courses training practical nurses and health aides, two rapidly growing fields with below-average earnings, the earnings in the high growth fields are typically greater than the national median.

The federally-supported vocational education programs are concentrated in the high schools but they offer extensive training to persons beyond the normal high school leaving age. These courses are offered in post-secondary programs, often in community colleges or technical institutes, and in special adult programs. High school students made up approximately half, post-secondary close to a sixth, and adult students a third of all enrollments in the early 1970's. In terms of enrollments, accordingly, the vocational programs are involved with large numbers of persons who are, or could readily be, in the labor force.

The post-secondary and adult programs are concentrated in the health, technical, and trades and industry program areas. They made up three-fifths or more of the total enrollment in 1970 in the programs related to the study occupations in each of these areas. The programs intended for students who have left high school are frequently more closely geared to specific occupations than are the high school programs. The better-paying fields which typically require higher levels of education and occupational preparation are often important in the programs for the more adult students. It is also apparent that a number of the programs offered to persons who are no longer in high school lead to careers with poor earnings and that, in some instances, the high school programs provide training for careers in the better-paying fields.

The concentration of the different program levels in areas related to high and low paying occupations is illustrated in Table 5-4. As in Table 5-3, high paying refers to occupations in which full-year workers earned at least 25 percent more than the national median in 1970 while the low paying fields paid these persons at least 25 percent less.

Table 5-4

Distribution of Enrollments by Program Level in Vocational Programs Related to Occupations With High and Low Earnings in 1970

Program	Percent Distribution of Enrollments			
	Secondary	Post-Secondary	Adult	Total
Programs Related to High Earnings Fields:				
Finance and credit	20.7%	7.2%	72.1%	100.0%
General merchandising Apparel and accessories	53.5	15.2	31.2	100.0
Hardware and building materials Industrial marketing	29.4	19.5	51.1	100.0
Personnel, training, and related programs	16.5	32.1	51.4	100.0
Programs Related to Low Earnings Fields:				
Agricultural production	57.8	0.9	41.2	100.0
Landscaping	73.8	9.5	16.7	100.0
Practical nursing	8.7	70.6	20.7	100.0
Nurses assistant	30.7	18.2	51.1	100.0
Medical assistant	12.0	58.5	29.5	100.0
Care and guidance of children	37.0	37.9	25.1	100.0
Clothing management Dressmaking Home furnishings	33.6	9.9	56.5	100.0
Accounting and computing	60.9	21.4	17.7	100.0
Stenography and secretarial	62.5	16.5	21.0	100.0
Typing	72.4	4.5	23.1	100.0
Cosmetology	66.5	23.6	9.9	100.0
Quantity food preparation	50.8	15.9	33.3	100.0
All Programs Related to Study Occupations	52.2	14.9	32.9	100.0

Source: U.S. Office of Education, Enrollment in Vocational Education Occupational Programs, Vocational Education Information, No. II, 1971.

Post-secondary and adult programs accounted for two-thirds or more of the enrollment in three of the four high paying fields listed in the table. They also made up two-thirds or more of the enrollment in four of the low paying occupations. The high school programs were less well represented in the high paying areas. But they also constituted two-thirds or more of the enrollment in only three of the fields with low earnings. Two tendencies stand out in the distribution of enrollments by educational level in Table 5-4. One is the greater representation of the post-high school programs in the better paid fields. The other is the substantial representation of both the high school and the post-high school enrollments in the poorly paid fields. Educational level, accordingly, is a poor discriminator of the earnings prospects associated with the different program levels.

IV.

The responses of the vocational education system to changes in the larger society are illustrated by the participation of women and nonwhites in the vocational programs. In both instances, social changes have generated pressures to increase the enrollment of students from these groups and to upgrade the occupational preparation available to them as a means for overcoming their disadvantaged status in the labor market.

Women and nonwhites make up two of the most rapidly growing segments of the labor force. Women are expected to constitute over two-fifths of the growth in the civilian labor force between 1970 and 1985, and nonwhites close to one-fifth. 1/ The weight of the numbers involved, as well as the social and equity issues, suggest that decisions as to future directions in dealing with students from the two groups will have an important bearing on the role of vocational education as a change agent in implementing the nation's commitment to equal opportunity goals.

Data on enrollments by race are unavailable for individual vocational programs. Office of Education reports indicate that blacks, American Indians, and Orientals accounted for a sixth of the overall vocational enrollments in 1972. A survey in the late 1960's reported that in their sample, the same proportion of black males as white males, 16 percent, had taken a high school concentration in the vocational program. 2/

1/ Manpower Report of the President, 1975, pp. 206, 207, 312, 313.

2/ Career Thresholds: A Longitudinal Study of the Educational and Labor Market Experience of Male Youth, Vol. 3 (1968 data), Bureau of the Census and Center for Human Resources Research, Ohio State University. Published as Manpower Research Monograph No. 6, Department of Labor, 1971.

These data indicate that nonwhites are substantially represented in vocational programs. In the absence of more detailed information, the implications of the global figures on nonwhite participation are obscure. Increasing nonwhite enrollment in programs to enhance their work skills and earning capacity has received widespread support. Some blacks and others have dissented from this approach on the grounds that emphasis on vocational education as possessing a special significance for them has represented an effort "to increase the individual's labor value...within the context of second class citizenship." 1/

Recent court decisions spelling out the applicability of equal employment legislation to women imply that concern with expanding occupational choices for members of disadvantaged groups will become a more important issue in the next decade than in the past one. 2/ The distribution of the vocational enrollments for women in 1970 and in the Office of Education projections for 1977 is summarized in Table 5-5. The table deals with enrollments in all programs since data dealing only with the programs related to the occupations considered in the study is unavailable.

1/ Grubb, W.N., and Lazerson, M., "Vocational Education in American Schooling: Historical Perspectives," in Inequality in Education, Center for Law and Education, Harvard University, March, 1974, p. 6.

2/ For a discussion of these changes see Shaeffer, Ruth G., Nondiscrimination in Employment, 1973-1975, The Conference Board, 1976.

Table 5-5

Distribution of Female Enrollments in Major Vocational Program Areas, 1970 and Projected 1977

Program [a]	Percent Distribution of Female Enrollments 1970	Percent Distribution of Female Enrollments 1977
Agriculture	0.8%	1.9%
Distributive education	12.1	11.5
Health occupations	7.8	12.7
Office occupations	68.8	59.1
Technical occupations	1.3	1.2
Trades and industry	9.2	13.6
Total	100.0%	100.0%

[a] Home economics (gainful) has been omitted from this list because of the unavailability of detailed projections of enrollment by sex in 1977. In 1970 an estimated 5.9 percent of the female vocational enrollments were in gainful home economics programs related to the occupations considered in the study.

Source: U.S. Office of Education, Trends in Vocational Education, Fiscal Year 1972, Vocational Education Information, No. II, 1973, and unpublished U.S. Office of Education data on enrollments by sex.

The information in the table shows that planning in vocational education is concerned with increasing the occupational choices open to women in the next five or ten years. More women would be participating in trade and industry programs in 1977 than in 1970, and fewer would be enrolled in office occupation courses. These changes would take place in a setting in which the vocational enrollments in the past had been heavily concentrated in programs preparing women for jobs in the traditional female occupations. The preponderant concentration for women has been in programs preparing them for employment in clerical jobs. While the enrollment projections for women indicate an intention to give a lesser priority to this area, over half of the women in vocational programs intended as preparation for gainful employment in 1977 would still be enrolled in this one area.

Encouraging women to prepare for employment in fields which have historically been regarded as "women's jobs" eases the problem of placement for women in the vocational programs after they have left school. Since the traditionally female occupations provide earnings below the economy-wide median, preparation for employment in these fields typically prepares persons for jobs in the less-well paid areas. For example, based on the 1970 enrollment information in programs related to the study occupations, about 55 percent of all female vocational students were in programs offering training for employment in occupations in which the median earnings for full-year workers were less than three-fourths of the national figure. By comparison, about 25 percent of the males were enrolled in programs related to these more poorly paid fields. Contributing a large supply of new entrants to these jobs each year facilitates the continuation of the low earnings characterizing them. For a large majority of women, high school is the time that formal career planning and training take place. These plans, and the related occupational preparation, have frequently been oriented to preparing women for a short period of employment in anticipation of an extended or permanent withdrawal from the labor market. This emphasis helps to explain the importance attached to training leading to clerical jobs. The problem with the short-term career planning and the occupational preparation geared to it is the built-in tendency to overlook the far-reaching changes that have been taking place in female participation in the labor force. These changes are described by the data on female labor force participation in Table 5-6.

Table 5-6

Labor Force Participation by Women, 1960, 1973, and Projected 1985

Age Group	Percentage of Women Age 16 and Over in Labor Force		
	1960	1973	Projected 1985
All ages	37.8	44.7	46.0
20 - 24	46.2	61.1	65.0
25 - 34	36.0	50.1	51.0
35 - 44	43.5	53.3	54.5

Source: Manpower Report of the President, 1975, p. 57.

The most important change in labor force participation since 1960 has been an upsurge in the proportion of young women, and especially women in the typical child rearing ages. For example, by 1973 over half of all women in the 20 to 44 year age group were either at work or looking for a job. By the early 1970's, mothers with school age children were about as likely to be in the labor force as were unmarried young women in the 1950's. 1/ In addition, later age at marriage and the greater frequency of divorce have made for a larger number of unmarried women who work. For those who leave because of child rearing responsibilities, many seek to return to work soon after their children are born or after they are off to kindergarten, nursery school, or the first grade. Re-entry into jobs held before is sometimes impossible, and often offers few long-term career prospects. For women who do not withdraw from the labor force because of family responsibilities, jobs entered into on the basis of short-term planning horizons frequently lead to dead ends. These problems are underscored by a recent survey of women in the 30 to 44 year age group. The survey reported that with the passage of time more of these women had retrogressed in their careers than had progressed. In other words, they were occupying a lesser job category at the time of the survey than the first job held for six months after leaving school. 2/

"Women's need for a wider range of occupational choices," according to the 1975 Manpower Report of the President, "remains acute." 3/ A comparable need is present for blacks and for members of other disadvantaged groups. The scope of the problem points to a need for retraining and upgrading programs for adults to prepare them for employment in new careers. It also indicates the desirability of guidance programs which expand occupational aspirations, to second-career counselling, and to continued greater shifts in the distribution of enrollments in the vocational programs. The transition from school to work has dominated much of the planning in vocational education and manpower programs. Allowing for the importance of this transition, it is only one turning point which is significant for women or other persons with a disadvantaged labor market status. For women who leave the labor force and then seek to return, the transition back into employment can pose equally difficult problems. For many who are already employed, the transition from a job with few prospects to a more promising career can represent a major problem. The vocational education systems have not created the underlying problems which lend weight to these transitions, nor are they likely, by themselves, to provide the remedy. More essentially, they have tended to take the occupational choices of the recent past as given and accommodated to them. Programs more heavily oriented toward the needs of women and nonwhites can facilitate enrollment growth in a period of declining school age population and contribute significantly to achieving equal employment goals in the coming decade.

1/ Manpower Report of the President, 1975, p. 57.

2/ U.S. Department of Labor Manpower Administration, Dual Careers, Manpower Research Monograph, No. 21, 1970, Vol. 1.

3/ Manpower Report of the President, 1975, p. 71.

V.

A series of pressures influence the priorities in vocational education that affect the occupations trained for and influence who enrolls in the program. One is the interest of employers in obtaining a work force possessing the skills needed for their operations, or equipped with the basic knowledge to acquire specific skills with minimum training costs after they have been hired. A second are the pressures for change in national legislation assigning a high priority to meeting the economy's anticipated manpower needs and expanding services for the disadvantaged and and the handicapped. These are frequently reinforced by social pressures affecting legislation, national policy, and public opinion. A third are the influences tending toward a maintenance of the existing priorities arising out of the presence of already established programs representing substantial investments in facilities and equipment and with a tenured faculty. In addition, student interests in the education and avocational, as well as the career, aspects of vocational education are often important in program planning.

Each of these influences carries with it a program orientation which sometimes overlaps and sometimes differs from the orientation implied by other pressures. Emphasis on serving the manpower needs of industry leads to an emphasis on training skilled workers and technicians in the school programs. Considerations of efficiency in this kind of training would frequently encourage an investment in resources for educating the more capable with a lesser emphasis on the disadvantaged and the handicapped. The social goals of serving the disadvantaged stress the importance of enrolling more persons who are frequently hard to reach and teach, and who typically possess limited educational and occupational aspirations. The aim of placing a larger number of persons from disadvantaged backgrounds in jobs is more readily realized in occupations involving lesser skills for which there are many openings than in highly skilled positions with few openings and lengthy preparations. The presence of an existing faculty and facilities, or student interest, may encourage the continued existence of programs in areas which lead to few jobs.

Whatever accommodations are arrived at in reconciling differences in objectives, the choices of occupations to train for will loom heavily in program planning in vocational education in the next decade. In terms of the specific occupations considered in the study, a number stand out as offering sufficient potential for priority consideration in the high school and post-high school programs to warrant separate mention. They are fields in which the median earnings of full-year workers are expected to amount to 75 percent or more of the economy-wide median by 1985, or to nearly $11,500 or more in that year. In addition, they are large enough to account individually for an annual average of 10,000 or more job openings in the 1970 to 1985 period. Their educational level is expected to be similar to that of the vocational students since half or more of the work force in each occupation is projected to have completed between 12 and 15 years of schooling. The anticipated job openings and the representation of women and nonwhites in the 35 occupations meeting these conditions in the mid-1980's are described in Table 5-7.

Table 5-7

Projected Annual Average Job Openings, 1970 to 1985; and Representation of Women and Nonwhites in 1970, Selected Study Occupations

Occupation	Annual Average Job Openings, 1970-1985	Proportion of Women and Nonwhites in Occupational Work Force in 1970	
		Women	Nonwhites
Drafters	17,000	8%	4%
Electrical and electronic engineering technicians	13,300	6	5
Engineering and science technicians, n.e.c.	29,700	18	5
Personnel and labor relations workers	29,100	31	6
Registered nurses	70,300	97	9
Buyers, wholesale, and retail trade	11,800	29	2
Managers and administrators, n.e.c.	247,500	12	3
Managers and superintendents, building	13,000	41	6
Restaurant, cafeteria, and bar managers	22,300	34	3
Sales managers and department heads, retail trade	18,900	24	7
Real estate agents and brokers	26,900	32	2
Sales representatives, manufacturing	16,800	8	2
Sales representatives, wholesale	31,200	6	2
Sales workers, retail trade	21,400	13	3
Computer and peripheral equipment operators	14,400	29	9
Miscellaneous clerical workers	50,200	64	9
Payroll and timekeeping clerks	14,300	69	6
Shipping and receiving clerks	15,100	14	13
Statistical clerks	22,200	64	8
Stock clerks and storekeepers	27,300	22	11
Air conditioning, heating and refrigeration mechanics	12,200	1	5
Auto mechanics	29,000	1	8
Carpenters	40,100	1	6
Electricians	23,100	2	4
Foremen	51,800	8	5
Heavy equipment mechanics, including diesel	31,100	2	5
Machinists	15,200	3	6
Plumbers and pipefitters	18,300	1	6

Table 5-7 (Continued)

Occupation	Annual Average Job Openings, 1970-1985	Proportion of Women and Nonwhites in Occupational Work Force in 1970	
		Women	Nonwhites
Bus drivers	13,800	28%	15%
Checkers, examiners, and inspectors, manufacturing	35,300	48	8
Cutting operatives, n.e.c.	11,400	26	3
Delivery and route workers	27,100	3	11
Welders and flame cutters	26,000	6	10
Firefighters	11,700	1	3
Police and detectives	19,300	4	7

Sources: U.S. Bureau of the Census, 1970 Census of Population, Occupational Characteristics, and Conference Board projections.

All told, the thirty-five occupations listed are expected to generate an average of over a million job openings a year in the 1970 to 1985 period. Where, and to what extent, they offer realistic prospects for an expansion of vocational training efforts will vary from one locality to another. A priority for training programs oriented toward these occupations would foster a shift in vocational education toward a greater emphasis on the more skilled white-collar, craft, and service fields. Most, but not all, are fields in which women and nonwhites are already present in modest or sizeable numbers. The major exceptions are in skilled crafts for women and specialized sales and managerial fields for nonwhites. Programs geared toward the occupations cited, therefore, can both contribute to meeting anticipated manpower needs and expand career prospects for persons from disadvantaged or other backgrounds.

In the light of the multiplicity of objectives influencing vocational enrollments, it is reasonable to expect that the relationship between vocational enrollments and the economy's manpower requirements will often be a loose one. But, since the availability of workers with the skills in demand is one of the underlying factors affecting the magnitude and direction of economic change, vocational education has a role in facilitating economic growth. In turn, the primary gainers from a dynamic economy are likely to be persons from disadvantaged and low-income backgrounds for whom barriers become less formidable in an expanding economy. These considerations suggest that manpower implications, such as those treated in this report, will continue to provide a critical dimension in planning vocational programs reflecting the needs of students and the goals of society.

APPENDIX A

THE NATIONAL PROJECTIONS

Introduction

This appendix is concerned with the data and data sources, projection techniques, and benchmark checks utilized in the development of the projections analyzed in the study. The study represents an effort to project a series of occupational characteristics including the educational, racial, and sexual composition of the occupational work force and their earnings. While there are many projections of job openings, no other projections are currently available for these characteristics for large numbers of detailed occupations.

Two alternative approaches to occupational projections are generally available. The first is to use a mathematical model of each occupation in which the characteristics considered are stratified by age, sex and race, and education cohorts, and these cohorts are projected. While this approach clarifies the assumptions and interactions involved, interoccupational mobility over time, shifts in trends, and informed judgement become difficult to incorporate into the framework. The Bureau of Labor Statistics recently stated, "There is no reliable method to effectively project occupational age distribution...(because of)...insufficient data on occupational mobility." 1/

The approach taken in this study was to use recent historical data, especially Census data and judgements concerning the impact of current developments as a basis for projecting the proportion of women, nonwhites, college graduates, etc., in each occupation. Special attention was given to trends indicated by a comparison of the 1960 and 1970 Census findings, especially where these could be confirmed by more recent information. While the specific findings presented have been derived by a series of projection techniques, they are consistent with the model of the economy used as the basis for the Department of Labor's manpower projections. At each step in the process, the data was examined for their "reasonableness." Data from the Current Population Survey was used to help identify "turning points" in the trend for sex and race (data on educational attainment is not available by detailed occupation from the CPS) or to provide an additional point in time, 1973, beyond the Decennial Census.

The technique used in the projections was that of examining the percentage point rather than the percent change in the characteristic. This has a considerable "tapering effect" on the projections. For example, the proportion of bank officials and financial managers who were women went from 8.7 percent to 17.4 percent from 1960 to 1970, an increase of 8.7 percentage points. Projecting this change to 1980 would give a 26.1 percent figure for women. An alternative projection method would be to look at the percent change in a variable over time. In the example above

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1/ U.S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Supplement No. 4, 1974, p. 6.

there has been a 100 percent increase in the proportion of women bank officials. This trend continued to 1980 would yield a 34.8 percent figure. Such geometric projections tend to magnify large changes as they are carried forward into the future and often provide results which appear unrealistic.

The benchmark check for the projections of sex, race, and educational attainment was to compare the estimates for the study occupations with independent projections of the labor force by these characteristics proposed by the Bureau of Labor Statistics. The procedure used here was to sum employment in the study occupations for a characteristic, i.e., number of persons completing less than 12 years of education, in 1960 and 1970 and subtract this total from the BLS total for all occupations to yield a "residual" group. This "residual" group was then projected to 1980 and 1985 (as a group) using the same technique as for an individual occupation. The residual and study occupations were then totaled for the projected years and compared with the BLS labor force projections for the same characteristic. An error of not more than 10 percent was set as a criterion of reasonableness for the aggregates. The differential in most instances was considerably less than 10 percent.

The technique used in projecting earnings was to relate changes in constant dollar earnings in the individual occupations to changes in productivity. Median earnings for persons who worked 50-52 weeks in each of the census years was taken as the earnings base. The productivity measure used was constant dollar Gross Product Originating (GPO) per employee by industry. The technique used in making these projections and the criteria for selecting the occupations considered in the study are discussed in greater detail later in this appendix.

The Economic Framework for the Study

In order to interpret the results of a study of occupational characteristics, it is necessary to have a basic economic and social framework behind the projections. Such a framework not only allows the analyst to better understand the results, but provides indications of how alternative assumptions about the economic environment might affect the projections. In addition, the aggregates in the framework can serve as benchmarks for assessing the consistency and reasonableness of the occupational projections.

The overall economic and demographic framework for the study is that published by the Bureau of Labor Statistics in 1974. 1/ This model as-

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1/ U.S. Department of Labor, Bureau of Labor Statistics, The U.S. Economy in 1985, Bulletin 1809, 1974.

sumes an average annual GNP growth rate of 4.2 percent during the 1970-85 period, a return to full employment by 1980, i.e., an unemployment rate of 4 percent, total civilian labor force growth of 1.7 percent per year, and annual productivity growth measured in terms of GNP per worker of 2.5 percent between 1970 and 1985.

One of the limiting factors to growth in the 1980's will be a decline in the number of young workers in the 14 to 24 age group, a decline of 3.3 million between 1980 and 1985. This is a result of declining birth rates during the 1960's. The decline in the number of young people is offset by an expected increase in the labor force participation of women and nonwhites over the coming decade. The major indicators summarizing the economic framework are shown in Appendix C, Table C-1.

Changes in these economic assumptions would affect the projections in several ways. If the 4.2 percent GNP growth rate were not attained, the prospects for providing jobs to an expanding labor force would decrease. For instance, if the rate of unemployment was 6 percent instead of 4 percent, there would be close to two million fewer persons at work. Women and nonwhites could be expected to have substantially higher unemployment rates in this event, and it would be more difficult for them to penetrate into new fields. The anticipated productivity growth and earnings levels would also probably be lower if the assured GNP growth rate were not attained.

Unforeseen shifts in industrial composition often reflecting changes in national priorities can also influence the demand for workers in various occupations and skill levels. A high priority assigned to energy research, development and production would require a different mix of manpower than a high priority for, say, improving health care through national health insurance. The BLS is currently preparing projections based on alternative assumptions regarding unemployment and energy use in order to more fully assess the economic and manpower impact of such changes.

Selecting the Occupations for Study

The study is concerned with the occupations which are either related to major vocational progress or are regarded as offering good prospects for future vocational programs. Occupations which are of a professional nature and generally require a four year college degree or more were excluded as outside the sphere of the vocational education system. Engineers, teachers, and physicians are examples. At the other end of the scale, occupations which require little or no formal training and for which the majority of workers have less than a high school education were also omitted. Unskilled fields, such as janitors, maids, and ushers are illustrations.

This discussion suggests the need for a selection process for determining which occupations are within the scope of the vocational system.

One of the selection criteria was that all occupations related to "major" vocational programs be included in the study. A projected enrollment level of 35,000 by 1977, according to U.S. Office of Education estimates, was used as the cut-off level of a "major" program. This resulted in the selection of about 50 vocational programs which are expected to account for over 80 percent of public vocational enrollments by 1977. These programs were related to 100 Census occupational titles. Nonprofessional occupations which did not meet the enrollment criterion were included if they appeared to be prospective candidates for vocational programs. These other occupations were selected on the basis of the current educational attainment of the workers in the occupation; their earnings level; and the projected number of job openings. Occupations not related to major vocational programs were included in the study if: a) at least one-third of the work force in the occupation in 1970 had between 12 and 15 years of schooling; and b) the median earnings of full-year workers in 1970 were at least three-fourths of the national median for all occupations; and c) an annual average of at least 10,000 job openings were expected in the occupation between 1970 and 1985. All three of these criteria had to be met for inclusion of occupations which did not meet the enrollment criterion.

The educational criterion implies that the current and future educational make-up of the occupation would be similar to that of the vocational graduates. The earnings cut-off suggests that the occupation should provide a reasonable prospect for decent earnings. The job openings standard assures that the number of jobs in the occupation over the next decade would be substantial enough to warrant attention by vocational educators. Twenty-three additional occupational titles were selected on the basis of meeting all three of these criteria.

Several vocational programs or census occupations were excluded although they met the standards discussed. These were programs or occupations which generally correspond to the "all other programs" designation in a vocational field or the "not elsewhere classified" occupations in a census group. In these cases, it is impossible to relate the vocational program to a specific occupation or family of related occupations, or the occupation to a particular program. All told, the 123 occupations remaining after the exclusions accounted for 55 percent of total civilian employment in 1970.

Data and Data Sources

The basic data for the study relates to the characteristics of occupations and the people employed in them. Data on vocational enrollments and completions in programs related to the occupations also figure in the study. The data used comes primarily from sources in the Bureau of Labor Statistics, the Bureau of the Census, and the U.S. Office of Education. Both published and unpublished materials were obtained from the agencies, including special counts from the one percent Public Use Samples from both the 1960 and 1970 Decennial Census.

Table A-1 identifies all of the various sources used for each data element and the information obtained. The Decennial Census provides historical data on the occupations and their characteristics. More recent data is available on an annual basis on the distribution of employment by race and sex from the Current Population Survey, but this information was often of limited value for individual occupations because of the small sample size. Projections of the educational attainment, race and sex make-up of the aggregate labor force are available from Bureau of Labor Statistics published sources along with productivity data required to make earnings projections for the occupations.

Published data is generally sufficient for most of the occupational characteristics information. Special tabulations from the 1970 Census were required to identify race and educational attainment by occupation for the under 35 year old group. A special tabulation from the 1960 Census was required to identify educational attainment for that year by detailed occupation. The published and unpublished data sources are summarized in Table A-1.

Table A-1

Data Sources and Information Obtained for Occupational Characteristics Study

Data Sources:	Information Obtained:
1) Employment and Job Openings	
a) U.S. Dept. of Labor, Bureau of Labor Statistics, Unpublished Occupation by Industry Matrix.	a) Nation-wide employment by occupation, 1970, 1980, and 1985.
b) U.S. Dept. of Labor, Bureau of Labor Statistics, *Tomorrows Manpower Needs*, Supplement No. 4, 1974.	b) Separation rates by occupation, 1970, 1985.
c) U.S. Dept. of Commerce, Bureau of the Census, Census of Population, 1970, *Detailed Characteristics*: *U.S. Summary*, PC (1) - D1	c) Nation-wide employment by occupation, 1960, 1970.
2) Sex and Race	
a) U.S. Dept. of Labor, Bureau of Labor Statistics	a) Unpublished data on employment by race and sex for detailed occupational titles from Current Population Survey 1960-73, selected years.
b) U.S. Dept. of Commerce, Bureau of the Census, Census of Population, 1970, *Detailed Characteristics*: *U.S. Summary*, PC (1) - D1; and Subject Report, *Occupational Characteristics*, PC (2) - 7A.	b) Employment by sex, 1960, 1970 and employment by race 1970 for detailed occupations.
c) U.S. Dept. of Commerce, Bureau of the Census, Census of Population, 1960, Subject Report, *Occupational Characteristics*, PC (2) - 7A.	c) Employment by race, 1960, for detailed occupations.
d) Unpublished tabulations from 1970 Census.	d) Employment by race, 1970, for detailed occupations.

Table A-1 (Continued)

Data Sources:	Information Obtained:
3) Educational Attainment	
a) U.S. Dept. of Labor, Bureau of Labor Statistics, Educational Attainment of Workers, 1959, Special Labor Force Report No. 1; and Educational Attainment of Workers, March 1969, 1970, Special Labor Force Report No. 125.	a) Nation-wide employment by level of educational attainment, 1959, 1970.
b) U.S. Dept. of Labor, Manpower Report of the President, 1974.	b) Projected educational attainment for the labor force, 1980, 1990.
c) U.S. Dept. of Commerce, Bureau of the Census, Census of Population, 1970, Subject Report, Occupational Characteristics, PC (2) - 7A.	c) Educational attainment for all age groups by detailed occupation, 1970.
d) Unpublished tabulations from 1970 Census.	d) Educational attainment for under 35 age group by detailed occupation, 1970.
e) Unpublished tabulations from 1960 Census.	e) Educational attainment for all ages and under 35 age group by detailed occupation, 1960.
4) Earnings	
a) U.S. Dept. of Commerce, Bureau of the Census, Census of Population, 1960, Subject Report, Occupational Characteristics, PC (2) - 7A; and Census of Population, 1970 Occupational Characteristics, PC (2) - 7A.	a) Median earnings by detailed occupation, persons working 50-52 weeks, 1960, 1970.
b) U.S. Dept. of Labor, Bureau of Labor Statistics, The U.S. Economy in 1985, Bulletin No. 1809, 1974.	b) Productivity data by industry; disposable personal income per worker, 1960, 1970, 1980, 1985.
c) Unpublished data, U.S. Dept. of Labor, Bureau of Labor Statistics.	c) Productivity data by industry, 1960, 1970, 1980, 1985.

Comparability of Occupational Data from Various Sources

As can be seen from the discussion of data and data sources, many sources were used to obtain the various types of occupational information needed for the study. It is, therefore, important to show where there is consistency among the sources and where adjustments were made to aid in maintaining consistency. Some data sources are deemed "more reliable" than others. Other series may have certain years or pieces missing. A final area of difficulty arises in moving from occupations and employment data to the vocational program data related to the occupations.

The Decennial Census provides the bulk of the occupational characteristics detail required for the study. However, there are problems of comparability between the Census definitions for different years. The 1960 Census contained information on some 250 occupational titles, while in 1970 this number was expanded to almost 450. The new titles sometimes come from the "splitting-off" of an occupation into several occupations. For example, the occupation "linemen and servicemen, telegraph, telephone, and power" in 1960 became three occupation in 1970--"telephone installers and repairers," "electric power line and cable workers," and "telephone line and splicing workers." New titles also come about by breaking out occupations from the "not elsewhere classified," n.e.c., designations. "Computer programmers," for example, were not identified separately in 1960, but were included with "professional, technical, and kindred workers, n.e.c.;" just as "precision machine operators," such as "drill press," "lathe and milling," and "punch and stamping press" were included in the "operatives and kindred workers, n.e.c.," designation in 1960.

"Cross-matching" of occupational titles between different Censuses is possible because a special retabulation of the 1960 Census according to 1970 occupational titles and definitions was undertaken by the Census Bureau. [1] This retabulation was done by sex so that complete comparability exists for this characteristic. For the other characteristics (race, education, and earnings) about two-thirds of the occupations studied (covering about 80 percent of employment) have directly comparable data for both years from the Census. For the other occupations, procedures were developed for making the projections adapted to the data requirements in each instance.

Data from the Current Population Survey (CPS), the monthly household survey conducted for the Bureau of Labor Statistics, proved to be of limited value in this study. While the occupational definitions used in the CPS are the same as for the Census, the small sample size often causes inconsistent changes in the proportion of women and nonwhites in individual occupations. For example, the proportion of practical nurses who were nonwhite jumped from 20 percent in 1962 to 27 percent by 1965, returned to 23 percent in the 1968 CPS, and was 25 in 1970 and 24 in 1973. The CPS data was consulted in particular instances where more information than the Decennial Census could provide was desirable. For example, if the 1960-70 change in the proportion of women was substantial, the CPS data was consulted for confirmation and any indication of change in that trend when comparing the 1960-65 period with the 1965-70, or the 1970-73 periods. Also, for those occupations which did not appear in the 1960 Census, the CPS was consulted as it provided an additional point of reference, 1973, for the occupations. The CPS does not provide comprehensive earnings and educational attainment data by detailed occupations, and, therefore, was not consulted for these indicators.

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[1] U.S. Department of Commerce, Bureau of the Census, 1970 Occupation and Industry Classification Systems in Terms of Their 1960 Occupation and Industry Elements, Technical Paper, No. 26, 1972.

The BLS national Occupation by Industry Matrix provides current and projected employment-by-occupation data, and this source is widely used in manpower planning. BLS uses the same occupational titles and definitions as Census and relies heavily on the Census data by occupation and industry. The BLS, however, incorporates special studies and surveys, information from professional associations, and the CPS data into the Matrix to obtain the "best estimate" of occupational employment. Because the BLS Matrix was used as the basis for the long-run employment projections, baseline demographic data from the Decennial Census must be adjusted to the BLS control totals for consistency. That is, the estimated number employed in an occupation in the 1970 Census may be slightly different than the corresponding figure in the BLS Matrix because other sources of data were used or because of other adjustments made by BLS. The demographic characteristics data for the occupation taken from the Census must, therefore, be scaled up or down to match the BLS Matrix total.

A critical link for this study is the one relating the occupational indicators derived from a Census-BLS Matrix base to the vocational programs which prepare individuals for employment. This link has been made by the BLS and has been used in this study. 1/ Any linkage between training and employment is likely to be imperfect. Some Office of Education vocational program titles are related to what appear to be quite different occupations. For instance, the occupations listed as related to the advertising services program include economists and decorators and window dressers. Another difficulty is that an occupation may be related to a number of different programs. For example, radio and T.V. mechanics and repairers are trained in the electronic technology program, as well as in the trades and industry area.

A final area of difficulty in the linkage is that the Office of Education data on enrollments is not always on the same level of detail as the BLS matching occupations. Where necessary, occupations and programs have been combined to fit the available data.

1/ U.S. Department of Labor, Bureau of Labor Statistics, "Matching 1970 Census Based BLS National-State Matrix Occupational Categories to Office of Education Instruction Programs," unpublished memo, May 31, 1974.

Projection Techniques

Job Openings:

Job openings in this report refer to average annual job openings in the 1970 to 1985 period. There are two components in the average annual job openings--employment growth and attrition. An average annual concept is used because it would be misleading and probably inaccurate to estimate job openings in a single year given the fluctuations in the business cycle. The employment data which provide the point of departure for the job openings projections are the BLS estimates for the same year and no independent projections of employment by occupation have been undertaken.

Along with projections of occupational employment, the BLS has published rates of "separation" from the labor force for each occupation for 1970 and projected 1985. 1/ These rates include separations due to deaths and retirements for men; deaths, retirements, marriage, childbearing, and "other" reasons for women. The rates are "age specific" with the rates for each age applied to the age distribution in the occupation in 1970 as reported in the Decennial Census to obtain an overall rate for the occupation. This figure is used to derive the attrition component in the job openings figure.

These figures may be regarded as minimal figures for job openings because many of the elements of "turnover" are not included. This would include voluntary separations or "quits" as well as involuntary separations or layoffs. Job openings created by promotion are also not included. Job openings in the apprentice occupations may be understated because they do not include replacement of those persons who "graduate" to journeyman status.

Perhaps the greatest difficulty with the separation rate concept is that it treats, say, a 55 year old male coal miner and a 55 year old male teacher alike in estimating the chances of death or retirement. That is, the separation rates are derived from average working life statistics by age and sex and these rates are assumed to be the same for different occupations. They do not take into account the "hazardousness" of a job or the retirement practices in a particular industry. However, most occupations and industries do not pose unique disparities in separation rates, and research has indicated that the labor force-wide separation rates are generally reliable. 2/

1/ See Table A-1, data source 1c.

2/ U.S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Volume 1, Bulletin No. 1606, 1969, p. 47-55.

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Sex and Race:

The projections presented of the sex and race employment distribution by occupation are essentially "surprise free" in that they are substantially influenced by recent trends. Underlying any trend is a series of often complex and conflicting forces. Why does the proportion of women in an occupation increase or decrease? Why are nonwhites increasing their representation more rapidly in some occupations than in others?

For instance, is employment for women bus drivers growing more rapidly than for men because of the large demand for school bus drivers who are typically part-time and paid less than other bus drivers and, accordingly, make this position unattractive to adult men? Are nonwhites making inroads into the health occupations because these occupations are growing rapidly and, therefore, must take all qualified applicants to avert manpower bottlenecks, or have the low wages deterred white job-seekers who feel they can earn more in a different career? The underlying explanations cannot be projected, and the projections, unless otherwise stated, assume that the institutional or other factors which have caused a particular pattern of change in the past fifteen years will continue.

The projection technique was to start with a straight line trend extrapolation of the percentage point change in employment based on the 1960 and 1970 Census. Stock and bond sales agents serve as an example of a projection which remained a straight line projection. The proportion of women increased from 6.0 percent to 8.6 percent from 1960 to 1970 and is projected to increase to 11.2 percent by 1980 (see Appendix C, Table C-8).

Many factors were then considered in arriving at a final projection. Was the proportion of nonwhites increasing especially rapidly when overall employment in the occupation grew rapidly? If so, is the occupation expected to continue to grow rapidly? If its rate of growth is expected to taper off according to the BLS projections, should the rate of penetration of nonwhites also diminish? Job and die setters serves as such an instance. The representation of nonwhites in this occupation increased from 2.3 to 5.1 percent from 1960 to 1970. Total employment grew by 60 percent during the same period. A straight line projection would place the proportion of nonwhites at almost 9 percent in 1980. However, total employment growth is expected to increase by only 35 percent during the 1970 to 1980 period or by less than two-thirds of the historical rate. The proportion of nonwhites was, therefore, adjusted downward to 7.2 percent in 1980.

There are alternative approaches to the procedures outlined above. The method commonly used to project labor force or population aggregates is to divide the population into age, race, and sex cohorts, and "age" the population over time. There are numerous technical problems associated with this approach when it is used for individual occupations. This procedure assumes a "closed" population for each occupation, where older workers die or retire and younger workers enter to replace them or to take new positions as the occupation grows in size. In reality, there is a constant "flow" among occupations. A 35 year old machinist may be a foreman by age 45 and no longer be counted in the machinist occupation. A 25 year old grinding machine operator may be promoted to take his place. For these reasons, this technique is seldom used for individual occupational projections.

Special projections were prepared for the 16 to 34 year old population in each occupation. Since this younger age group supplies the bulk of the new entrants into the labor force it should, therefore, provide a significant indication of future developments in changes in the representation of women and nonwhites in different occupations. The procedure utilized in projecting the under 35 age group was to relate the change in this group to movements in the "all ages group" over time. The steps in preparing these projections are described in Table A-2.

Initially, the historical relationship between the 16 to 34 component and all ages for the occupation was computed (step 2, Table A-2). This relationship was extended to 1980 and 1985 on a straight line basis (step 3). This ratio was applied to the projected proportion of whites and nonwhites (or men and women) to derive an initial distribution by race (or sex) for the 16 to 34 year old group (step 4). The distribution was then "scaled" to equal 100 percent (step 5).

Using this procedure, it was found that there were few changes in the relationship between the all-ages group and the younger-age group during the 1960 to 1970 period. The under 35 group did generally have a greater representation of nonwhites and women, however, suggesting progress toward more nearly equal representation in recent years. However, this comparison is limited since the "all ages" group also includes the "under 35" group in proportions which vary substantially from occupation to occupation.

As previously mentioned, the special retabulation of the 1960 Census provides complete comparability between the 1960 and 1970 Censuses for the occupational employment distribution by sex. However, gaps remain in the 1960 data indicating occupational representation by race. In such cases, projections were made based on the expected changes in similar occupations or groups of occupations, and on the most recent CPS data for the occupation. For occupations which were "split-off" from 1960 titles, the 1970 data was recombined according to the 1960 definition. This occupation was then projected as a "regular" occupation, with the desired occupations "broken-out" for the projected years. To cite an instance, salesclerks and salesworkers were combined to conform with the 1960 occupational title, or, sales managers and department heads were used to project buyers, wholesale and retail trade; payroll and timekeeping clerks were used to project billing clerks. There are 31 occupations without any specific 1960 race data; however, they account for only 11 percent of the projected 1985 employment in the occupations studied.

The projections were tested for overall reasonableness by comparing projected employment by sex and by race with the BLS labor force projections. The objective here was to determine whether the procedures utilized yielded results which were consistent with BLS projections for the entire economy. The steps were as follows:

Table A-2

Illustration of Steps in Projecting the Distribution of Employment by Race in the 16-34 Age Group in Individual Occupations

Step	1960		1970		1980	
	White	Non-White	White	Non-White	White	Non-White
1. Historical distribution of employment						
a. All ages	90%	10%	88%	12%		
b. 16-34 age group	85%	15%	80%	20%		
2. Historical ratio of 16-34 age group to all ages	.94	1.50	.91	1.67		
3. Projected ratio of 16-34 age group to all ages					.88	1.84
4. Derived distribution of employment for 16-34 age group					76%	26%
5. Adjusted distribution of employment for 16-34 age group					75%	25%

1. Sum employment by sex and race for the occupations studied for 1960 and 1970.

2. Subtract this sum from the total employment by sex and race in all U.S. occupations in 1960 and 1970 to obtain the aggregate characteristics distribution of the "residual" occupations.

3. Project the proportion of men, women, whites, and nonwhites in the residual occupations to 1980 and 1985 using the same technique used for the individual occupations.

4. Apply the proportions obtained in step 3 to the BLS projected total employment in the residual occupations for 1980 and 1985 to obtain estimated employment by sex and race for the residual occupations.

5. Sum projected employment by sex and by race for the occupations studied for 1980 and 1985.

6. Add the projections for the individual occupations and the residual group to obtain a derived estimate of total employment by sex and race.

7. Compare the estimate of total employment derived in this way with BLS projected employment by sex and race.

The derived projections of employment by sex and race were well within 10 percent of the BLS projection, and the projections were, therefore, accepted as "reasonable."

Table A-3 summarizes the benchmark check for sex and race. The 123 study occupations have a smaller representation of women than the entire economy. However, the proportion of women in these occupations was increasing during the 1960's and this percentage is projected to exceed slightly the overall representation figure by 1985. The reverse trend is evident in the "residual," or non-study, occupations. By 1985, almost 60 percent of all employed women are expected to be at work in the occupations studied, up from 53 percent in 1970. The proportion of all men employed in the occupations is projected to decline slightly. Significantly, the "derived" total employment for males and for the overall economy is within one percent of the BLS total.

As mentioned earlier, consistent 1960 data on employment by race was not available for all of the occupations included in the study. Therefore, only 92 study occupations are utilized in the benchmark check. The remaining occupations appear in the residual group. The 92 occupations account for 90 percent of employment in the study occupations and should, therefore, serve as a valid benchmark comparison. Nonwhites were underrepresented in the occupations studied but were increasing their representation during the 1960-70 period. This trend is projected to continue. The residual group had proportionally more nonwhites than the overall labor force but is declining. This trend is expected to be reversed slightly by 1985, as the representation of nonwhites in the overall econ-

Table A-3

Reconciliation of Employment Estimates by Sex and Race for Occupations Included in Study with BLS Estimates of Total Employment, 1960, 1970, and Projected 1985 (in thousands)

	1960		1970		1985 1/	
	Male	Female	Male	Female	Male	Female
Study Occupations	26,700	9,912	27,815	15,585	34,045	23,191
Residual Occupations	17,204	11,962	21,169	14,057	27,349	16,905
Derived Total All U.S. Occupations	-	-	-	-	61,394	40,096
BLS Total All U.S. Occupations	43,904	21,874	48,984	29,642	61,902	39,588
Derived Total All U.S. Occupations as a Percent of BLS Total	-	-	-	-	99.0%	101.0%
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Study Occupations 2/	31,749	2,339	35,879	3,125	45,630	5,173
Residual Occupations	27,101	4,589	34,302	5,320	44,047	6,640
Derived Total All U.S. Occupations	-	-	-	-	89,677	11,813
BLS Total All U.S. Occupations	58,850	6,928	70,182	8,445	88,869	12,621
Derived Total All U.S. Occupations as a Percent of BLS Total	-	-	-	-	101.0%	94.0%
Study Occupations as a Percent of BLS Total	54.0%	34.0%	51.0%	37.0%	51.0%	41.0%

1/ BLS projections are for the labor force. They have been adjusted to reflect employment by sex and race based on the historical differential between their respective unemployment rates and the BLS overall unemployment rate of 4% in 1985.

2/ Refers to employment in 92 study occupations for which 1960 data was available.

omy is projected by BLS to increase much more rapidly during the 1970-85 period than in the 1960's. As with the sex projections, the derived aggregate employment figures by race were within the 10 percent margin regarded as reasonable. The derived total for nonwhite employment was 6 percent less than the BLS projection, and for whites the independently derived total was one percent greater.

Tabulations from the 1973 and 1974 Current Population Survey by the BLS indicate that the projected representation of women and nonwhites in the occupations are not unrealistic in light of labor market developments since the 1970 Census. A list of selected major occupations studied follows, showing the proportion of women and nonwhites in 1970 according to the Census, the 1973 and 1974 CPS, and Conference Board projections for 1980. While one or two year's CPS data based on small samples in individual occupations are far from conclusive, the CPS figures are generally consistent with the 1970 to 1980 projections. The comparison is presented in the table which follows (Table A-4).

Table A-4

Comparison of Proportion of Women and Nonwhites in Selected Occupations Studied from
1970 Census, 1973 and 1974 Current Population Survey, and 1980 Projections

	1970 Census		1973 Current Population Survey		1974 Current Population Survey		1980 Projections	
Occupation	Women	Nonwhites	Women	Nonwhites	Women	Nonwhites	Women	Nonwhites
Computer programmers	22.7	5.5	21.9	4.8	22.6	N.A.	20.0	6.8
Registered nurses	97.4	9.0	97.8	10.0	98.0	10.1	97.3	11.5
Draftsmen	8.0	4.4	7.8	5.8	7.7	6.7	10.5	6.5
Real estate agents and brokers	32.3	2.2	36.4	1.5	38.3	N.A.	31.8	2.3
Bookkeepers	82.1	3.6	88.3	4.1	89.2	4.4	80.8	5.7
Secretaries	97.6	3.9	100.0	5.6	99.2	5.1	98.3	5.7
Carpenters	1.3	6.2	0.7	5.5	N.A.	6.1	2.2	7.1
Electricians	1.7	3.6	0.6	4.1	N.A.	4.5	2.7	5.1
Auto mechanics	1.4	8.5	0.5	8.9	N.A.	7.7	2.4	9.6
Assemblers	48.7	13.4	49.7	14.0	50.1	14.3	51.4	15.9
Welders	5.7	10.2	4.7	11.6	5.0	9.8	6.9	14.0
Bus drivers	28.3	15.3	36.2	19.6	37.4	20.4	43.0	19.4

Sources: U.S. Department of Labor, Bureau of Labor Statistics; The Conference Board estimates.

Educational Attainment:

Projections of educational attainment in the occupations were prepared in a similar manner as those for employment by sex and race. Projections are presented both for the all ages group and for those in the 16-34 age group. The data for the projections comes from both published and unpublished data from the 1960 and 1970 Census. There is no published educational attainment by detailed occupation data in the 1960 Census, and the data for the 16-34 age group in 1970 is published only for a limited number of specific occupations. Special tabulations from the Census Public Use Tapes were utilized to provide counts of educational attainment for these groups.

The breakdowns utilized for the study were: 1) those completing less than 12 years; 2) 12-15 years; and 3) 16 or more years of schooling. This classification makes it possible to identify the number of high school drop-outs in an occupation, the potential competition from college graduates, and to focus on the prime target group for vocational education, those with between 12 and 15 years of schooling.

More than for the distribution of employment by race and sex, educational attainment is a function of the age distribution of the population. That is, younger workers, regardless of sex or race, tend to have higher levels of education than older workers. Accordingly, if an occupation has a large proportion of older workers who will die or retire over the next fifteen years, the educational level can be expected to increase rapidly. This will be especially true if the occupation is expected to grow and many new and younger workers are attracted to it.

Other factors which will influence future changes in educational attainment levels will be the rate of technological change and anticipated demographic shifts in the labor force. Technological change frequently displaces workers in less skilled occupations who have lower education levels (e.g., farm laborers, textile workers, etc.), and generates new demands for workers with higher educational levels (e.g., computer programmers, aerospace engineers, and health technologists, etc.). The demographic shift is expected to result in a reduction in the number of young people in the population, particularly during the 1980-85 period. This shift, coupled with a tapering-off in the college enrollment rate for young people, implies a slowing down in the rate of increase of educational levels in general and of college graduates in particular. 1/

While it would have been desirable to project the age distribution in each occupation by educational attainment group, in order to explicitly take account of the factors influencing changes in educational levels in an occupation, consideration of interoccupational mobility raise many questions about the relevance of this procedure.

1/ See Appendix C, Table C-1 for the population shift. See Richard B. Freeman, "Overinvestment in College Training," The Journal of Human Resources, Summer 1975, for a discussion of the shift in college enrollment patterns.

First approximations for projections were developed by extending out the percentage point change in the three education groups to 1980 and 1985. The magnitudes of change in many cases are quite dramatic, especially declines in the percent completing less than 12 years. In some cases, continuing the trend would lead to a negative number. For example, the proportion of stock and bond sales agents with less than 12 years of education declined from 19 to 8 percent from 1960 to 1970. In this case, the rate of decline between 1960 and 1970 rather than the percentage point change was used as the first approximation for the group. Proportions were then "scaled" to 100 percent as needed.

The next step was to apply the percentages to the BLS projected employment for 1980 and 1985 and compute percent changes for each group. These percent changes were then scrutinized for excesses. They were compared with the 1960-70 changes in the occupation and with anticipated changes in the entire labor force educational levels between 1970 and 1985 as projected by the BLS.

A consistent pattern in the occupations emerges where the number completing less than 12 years of school declines, and the number completing 12-15 and 16 or more years rises. Fairly large changes can and do occur in the occupations. It should be remembered that more than half of those employed in a particular occupation by 1985 will often not have been in that occupation in 1970. Employment growth increases employment by between one and two percent a year in most occupations, and the need to replace workers who die or retire each year is of the order of magnitude of three percent a year. Compounded over a ten to fifteen year period, the number of "new" workers in an occupation is obviously substantial. The educational attainment of this new group is generally different than those already employed in the occupation. Interoccupational shifts further reduce the number of workers who remain in the same occupational classification over time.

Projections for the 16-34 year old age group were then made using the same method as was used for sex and race. That is, the ratio of the 16-34 group to the all ages group for 1960 and 1970 was computed for each educational attainment cohort and extended to 1980 and 1985. The projected ratios were applied to the projections already prepared for the all ages group, and the derived proportions scaled to 100 percent. This younger age group may better reflect the characteristics of new entrants into occupations and, therefore, the type of competition faced by graduates of vocational programs. A benchmark check of the educational attainment projections, using the BLS projections for the labor force was undertaken making use of the same methodology as described in the section on sex and race. Ninety-two of the study occupations were used since the remaining occupations did not have 1960 educational attainment data.

The historical data indicate that the occupations studied have relatively fewer college graduates than the entire labor force and proportionately more persons with less than a college degree. The "residual" occupations show the opposite trend. This is to be expected since the residual group includes many more professional, technical, and managerial occupations. The projection of the residual occupations to 1985 indicate the proportion without a high school diploma in the group will approach that for the entire labor force. The "gap" between the proportion completing college is expected to widen. Summing the "residual" group projection and the study occupations for 1985 and comparing the derived total with the total projected by BLS; the margins of difference are well within the 10 percent range deemed as acceptable. The largest error, 5 percentage points, occurs in the smallest group--the college graduates.

Table A-5 provides the data for the benchmark check.

Earnings:

The projections of earnings are the most hypothetical of the indicators presented. Future earnings in occupations depend on a variety of factors. Shifts in the supply and demand for workers with the requisite skills, the presence or absence of unions, and the rate of growth in productivity in industries employing persons in different occupations are prime factors influencing earnings. Allowing for all of these factors, over time, productivity increases may be regarded as the "means" by which industry is able to pay increased wages. As workers produce more per unit of labor input, resources are generated which allow for increased compensation. Productivity changes may be reflected in market-determined wages and, also, in gains from collective bargaining. It is this latter concept, therefore, which should serve as the basis for long-term projections of real earnings.

An important factor affecting wages is the rate of inflation. Since money wage rates in some industries are more closely indexed to inflation than others through such means as automatic cost-of-living adjustments, "constant dollar" projections, as in the present study, provide an imperfect approximation of changes in real wages.

The procedure utilized in making the projections is as follows:

1. Each occupation was "linked" to an industry where the majority of workers were employed.

2. Historical and projected productivity data for the industries were compiled from BLS published and unpublished sources (constant dollar Gross Product Originating (GPO) per employee was used for this purpose).

3. The ratio of median earnings for workers working 50 to 52 weeks in the occupation to GPO per employee was computed for 1960 and 1970, and projected to 1985.

4. The projected ratio was then applied to the BLS projections of GPO for the industry to derive projected median earnings.

The ratio of median earnings to GPO per employee was projected to 1980 and 1985 by using a logarithmic function; assigning a value of one for 1960, 11 for 1970, and projecting the ratio for year 21 (1980) and year 26 (1985). The equation took the form of:

$$RJ\ 85 = RJ\ 60 + B\ (\log 26)$$

Table A-5

Reconciliation of Estimates of Employment by Level of Educational Attainment for Occupations Studied with BLS Estimates, 1960, 1970, and Projected 1985

	1960			1970			1985		
	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More
BLS TOTAL, ALL U.S. OCCUPATIONS [1/]									
Number	33,086	26,246	6,446	29,249	39,628	9,750	23,952	58,255	19,283
Percent Distribution	50.3%	39.9%	9.8%	37.2%	50.4%	12.4%	23.6%	57.4%	19.0%
STUDY OCCUPATIONS									
Number	17,851	14,317	1,918	14,996	21,390	2,619	11,536	34,810	4,458
Percent Distribution	52.4%	42.0%	5.6%	38.6%	54.6%	6.8%	22.8%	68.1%	9.1%
RESIDUAL OCCUPATIONS									
Number	15,235	11,919	4,528	14,253	19,235	7,131	11,658	25,242	13,786
Percent Distribution	48.1%	37.6%	14.3%	35.1%	47.4%	17.6%	23.0%	49.8%	27.2%
DERIVED TOTAL, ALL U.S. OCCUPATIONS									
Number	-	-	-	-	-	-	23,194	60,052	18,244
Percent Distribution	-	-	-	-	-	-	22.8%	59.2%	18.0%
DERIVED TOTAL, ALL U.S. OCCUPATIONS AS A PERCENT OF BLS TOTAL	-	-	-	-	-	-	97.0%	103.0%	95.0%
STUDY OCCUPATIONS AS A PERCENT OF BLS TOTAL	54%	54%	30%	51%	54%	27%	48%	60%	23%

[1/] 1960 figures for all occupations are interpolated from 1959 and 1962 BLS data as 1960 data is not available. Both 1960 and 1970 figures were adjusted to include 16 and 17 year olds which were not included in the BLS data base until 1972 and are included in their projections. 96 percent of this group were assigned to the under 12 years of schooling category and 4 percent to the 12-15 years category based on the 1972 BLS data. In 1970 the distribution without the 16 and 17 year olds was 34.8%, 52.3%, and 12.9% for those completing less than 12, 12-15, and 16 years or more of schooling, respectively.

Sources: 1975 Manpower Report of the President; 1960 and 1970 Census of Population; The Conference Board.

where RJ is the ratio of earnings to GPO for occupation J, and B is the difference in the 1960 and 1970 ratios for occupation J.

The use of a logarithmic formulation is one which is particularly suitable to time trend analysis, especially since only two points in time were available. This could result in inaccurate measurement of trend if either year is an aberrant one; either on the earnings or productivity side. Since log functions tend to "taper off" geometric trends, such aberrant measurements would be moderated.

Table A-6 outlines the industries and related occupations used in the projection procedure.

Table A-6

Industrial Sectors Supplying Productivity Benchmarks for Earnings Projections in Related Occupations

Industrial Sector	Related Occupation
Agriculture	Farm owners, managers, foremen, and laborers; Farm implement mechanics
Manufacturing	All non-medical technician occupations included in study; All craft workers and operatives, except transportation included in study (except as specified individually); Sales representatives, manufacturing
Durable manufacturing	Stock clerks and storekeepers; Painters, manufactured articles
Printing	All printing occupations included in study
Aircraft parts	Aircraft mechanics and repairers
Non-durable manufacturing	Sewers and stitchers
Transportation	Bus drivers; Truck drivers
Communications	Telephone line and splicing workers; Telephone installers and repairers
Electric utilities	Electric power line and cable workers
Wholesale and retail trade	Buyers and shippers, farm products; Managers and administrators, n.e.c.; Delivery and route workers
Wholesale trade	Sales representatives, wholesale
Retail trade	Sales managers and department heads; Restaurant, cafeteria, and bar managers; Salesclerks; Salesworkers

Table A-6 (Continued)

Industrial Sector	Related Occupation
Finance, insurance, and real estate	Bank officials; Stock and bond sales; Managers and superintendents of buildings; Real estate occupations
Services	Gardeners and groundskeepers; Salespeople, service and construction; Recreation workers; Childcare workers; Dressmakers; Auto mechanics; Auto body repairers; Designers; Decorators; Cooks; Food service workers; Bartenders; Hairdressers and cosmetologists
Hospitals	All health occupations in study
Educational services	School monitors
Hotel and lodging places	Housekeepers, except private households
Other personal services	Radio and T.V. repairers; Air conditioning and heating mechanics; Miscellaneous mechanics and repairers
Total, non-agricultural industries	All clerical occupations included in study (except as specified individually); Graders and sorters; Personnel and labor relations workers; All construction crafts included in study; Firefighters; Police and related occupations

With few exceptions, the industries related to particular occupations are self-explanatory. Health occupations are related to hospitals, farm occupations to agriculture, banking and real estate occupations to the finance, insurance, and real estate industry. Clerical occupations were related to productivity in all non-agricultural industries, as virtually all industries require these types of workers. Public service occupations, firefighters, police, etc. were also related to all non-agricultural industries because of the difficulties in measuring productivity in the public sector.

A special problem arose for construction workers (e.g., carpenters, electricians, painters, bulldozer operators, etc.) where productivity in all non-manufacturing industries was used rather than productivity in the construction industry itself. This was because of difficulty interpreting the significance of the productivity data for the construction industry. For example, while GPO per employee declined in construction by 5 percent from 1960-70, real earnings of carpenters and electricians rose by 23 percent, painters by 21 percent and plumbers by 26 percent. These changes are quite comparable with the 24 percent increase in GPO per worker recorded for all non-agricultural industries during the period. Whatever the reason (influential national unions, data inadequacies, supply/demand imbalance, etc.), productivity changes in all non-agricultural industries appeared to be a better measure of wage changes for the construction related occupations than productivity data for the industry alone. If alternate terminal or base years were used to determine productivity in the construction industry (e.g., 1958, 1959, 1971, or 1972), the decline would still occur.

The methodology utilized can be assessed by projecting median earnings for all U.S. occupations based on GPO per worker data for the entire economy from BLS. The median earnings projection can then be compared with the average personal income per worker projection from the BLS model for the same year. It would be reasonable to expect that the changes in median earnings would approximate the change in personal income per worker. This comparison is shown in the table below.

Table A-7

Comparison of Median Earnings and Personal Income per Worker, United States, 1970, and Projected 1985 (in 1973 dollars)

				Average Annual Rate of Growth	
	1960	1970	1985	1960-70	1970-85
Median earnings in all occupations	$7,260	$ 9,945	$15,260	3.2%	2.9%
Personal income per worker	8,320	11,310	16,510	3.1%	2.6%

While the median earnings and personal income estimates pertain to economy-wide aggregates, the relatively close similarity in the rates of change of the two independently derived measures suggests that changes in GPO per worker provide a useful benchmark for earnings projections.

Next Steps in Research

All of the projections for this study, with the exception of the job openings indicator, represent attempts by The Conference Board to extend the range of occupational projections. The research in this study indicates that such projections are feasible, even with present data limitations. The projections can and should be updated periodically, and can serve as the basis for more effective vocational education planning, counseling, and placement. They can help assess priorities for vocational education based on labor market information which can serve as an input into the planning process and the setting of program targets.

The research also indicates a need for improvement in the data base; both on the Census-BLS side and the vocational education reporting side. Most of the gaps in the Census-BLS data occurred in relating the 1960 data to the 1970 occupational definitions. Data on race, education, and earnings were not available for 1960 based on the 1970 definitions. If substantial changes are made in the 1980 Census occupational titles, the Census Bureau should consider a more extensive "recount" of 1970 data by the new definitions than was done for 1960. BLS data from the Current Population Survey was found to be of somewhat limited value because of the small sample size. Although it was not initially designed to provide occupational detail, but rather to measure unemployment, it is nonetheless the only comprehensive occupational series generated between Census years. Expanding the sample size, as BLS plans, would increase the statistical reliability and scope of the manpower information and increase its usefulness for planning in vocational education. Another difficulty in the CPS is that it did not adopt the 1970 occupational definitions until its 1972 survey. There is, therefore, no common point of time for the two series to be linked for some occupations. BLS should adopt the 1980 titles in the CPS as soon as these titles have become available.

The Bureau of Labor Statistics should consider initiating, as one of its ongoing activities, occupational projections similar to those prepared in this project. If the projections developed are useful for vocational planning, BLS with its specialized staff and technical skills would be the logical place to undertake this work. While BLS does acknowledge the technical difficulties in making projections similar to those contained here, difficulties often due to inter-occupational shifts, the agency is already conducting research in this area. Once national projections of the indicators are made, state-by-state estimates could be developed using techniques similar to those used in the National/State Occupation-by-Industry Matrix System.

The Office of Education vocational education reporting system can also facilitate the continued development of indicators similar to those presented in this report. More detailed and more standardized reporting of enrollments would facilitate comparison with the occupations. For example, under reporting requirements in effect from 1970 to 1974, enrollments for all metalworking occupations were reported together to the Office of Education. This cluster included several large and diverse programs; i.e., machine shop, machine tool, tool and die, sheetmetal, various welding programs, and brazing and soldering. While there is some overlap in the occupations related to these programs, there are sixteen different Census occupational titles associated with the "metalworking occupations" designation. Prior to 1970, data was collected for the individual programs within the metalworking group, and it is understood that the Office of Education has returned to this earlier classification.

Another area where more detailed reporting would aid in analysis of occupational indicators would be in the "business data processing systems occupations" group. Occupations falling in this group include computer programmers (who are also trained in the scientific data technology program), keypunch operators, and computer and peripheral equipment operators. These occupations clearly encompass a wide range of skills within the data processing field.

A considerable margin of uncertainty surrounds the vocational education data because of the non-standardized interpretation of such terms as "enrollment," "program," and the like. Experience in working with the states of New Jersey and Kentucky in this project indicate that there exist differences in the application of these terms. For example, is typing a "program" by itself, or a course within a secretarial program? While New Jersey reported almost 50,000 persons in the typing program, Kentucky reports none since they do not consider it a "program." The Office of Education should establish standard definitions of programs to be used in all reports submitted to it.

It is difficult to assess the progress made in the vocational programs in expanding opportunities for women or nonwhites because of the absence of adequate data on the make-up of enrollments. Reporting on the representation by sex in the different program areas was discontinued after 1972, while the reporting by race has referred only to total enrollments. It is understood that the Office of Education plans to resume this reporting.

Although the present study has utilized the linkages between occupations and vocational programs developed by the Bureau of Labor Statistics, those familiar with the linkage generally regard it as inadequate. A careful reading of the "cross-over" developed by BLS reveals that there are no Census occupational titles associated with two large technical programs--police science technology and civil technology. These two programs have projected enrollments of 107,000 and 40,000 respectively in 1977. Still other programs are related to occupational titles which clearly go beyond the program but for which graduates would be qualified for a "piece" of the occupation. Still other programs are related to such a wide variety of occupational titles that meaningful comparisons become impossible. For example, the supervisory, administration, and management program is related to the following occupations: clerical supervisors, n.e.c.; office managers, n.e.c.; assessors, controllers, and treasurers; and credit and collection agents.

Work is currently underway by the Bureau of Labor Statistics, the Office of Management and Budget, and U.S.O.E. to design a new "standard occupational classification system." Hopefully, this new system will eliminate many of the problems described above; however, the system is several years away from being complete, and it will likely take several more years until it is accepted and used in the field.

In conclusion, the range of occupational indicators available in the past has been too limited to provide an effective basis for planning in vocational education. The present study represents a first step in extending this range. While the techniques utilized are often imperfect, they indicate potentials for improvements in the information base for planning, potentials which can be realized with more research.

APPENDIX B

REPLICABILITY OF THE NATIONAL PROJECTIONS FOR INDIVIDUAL STATES

Introduction

To test the replicability of the national indicators at the state level, two states, Kentucky and New Jersey, were selected. These states were selected, in part, because they represent diverse economic and industrial bases, regional locations, occupational patterns, and educational systems. The availability of employment projections and the relevant educational data also figured in the selection.

In determining whether the national projections of occupational characteristics could also be prepared for states, many issues had to be addressed. These issues include whether: 1) consistent economic framework data existed for the states, 2) sufficient occupational data were available from published sources, 3) the data was sufficiently reliable to make projections, 4) benchmark checks could be developed to test the reasonableness of the projections.

Based on currently available data, projections of the sex and race indicators for occupations appear feasible but with limitations noted in this appendix. Projections of the earnings indicator are probably less feasible because of technical problems related to measuring productivity and because of the limited statistical reliability of the data in some cases. Projections of educational attainment, at least for the larger occupations and states, are possible if special tabulations from the Census are obtained.

The Economic Framework for State Projections

Both states participating in the study have adopted the national economic framework assumptions in the Bureau of Labor Statistics projections in preparing their own estimates. There is, therefore, consistency between the national and state projections for such important variables as labor force growth, employment, level of unemployment, productivity, aggregate federal expenditures, etc. The historic relationship between the magnitudes and changes in magnitudes for a given state variable and the same variable in the overall economy has been projected by the states and related to the overall economy figure for 1980 developed by the BLS. For example, the national model assumes a 4 percent unemployment rate for 1980. The states have not adopted this rate, but have determined what a 4 percent unemployment rate nationally will mean for their state based on the historical movement of the state rate compared with the comparable national rate. This may mean a higher or lower rate than the national figure in 1980 in many states. The fact that the states have "linked" into the national projections is a decided advantage in preparing the indicators for individual states. Historical and projected growth rates for occupations can be more readily compared among the states or nationally, since the economic assumptions are generally similar in most states.

Data, Data Sources and Comparability

The available data for state occupational indicators is less extensive than for the entire United States. The Current Population Survey does not provide reliable estimates of employment by detailed occupations for the states because of the small size of the sample drawn from many states. The Census Bureau did not publish data on educational attainment by occupation for 1960 for states, and educational data for 1970 is limited to a list of about 50 major occupations and groups. A similar situation occurs with earnings data, with a limited list of occupations for both 1960 and 1970.

The most consistent data is available for the sex and race indicators. The special Census retabulation of 1960 employment, according to the 1970 occupational definitions, provides comprehensive comparability for the sex indicator for the states. Race is comparable for about half the occupations covering the majority of employment included in the study. Complete 1970 data on race is available for the states, but only about half of the published 1960 titles are comparable because of changes in occupational definitions and because the 1960 race data is reported only at the "intermediate" level of detail.

Occupational employment and job openings projections to 1980 were prepared by both states participating in the study and served as the "take-off" point for the other occupational indicators. Kentucky is one of about 30 states cooperating with the Occupational Employment Statistics (OES) Program of the Bureau of Labor Statistics. This is a cooperative effort on the part of the state Employment Service and the BLS to develop state and metropolitan occupational employment projections. While not participating in the OES program, New Jersey followed the BLS methodology in deriving their employment and job openings estimate. 1/

The data for the occupational indicators come from several sources. The state employment security agencies provided the data on employment and job openings. The 1960 and 1970 Decennial Censuses provided the needed occupational data for the sex and race indicators as well as for earnings and educational attainment. Vocational enrollments or completions by program came from the state education agency or the U.S. Office of Education. Data from the U.S. Department of Labor and the National Planning Association were used for the benchmark checks of the projections.

The specific sources of data for each of the states is presented in Table B-1.

1/ For a full discussion of these methodologies see: U.S. Department of Labor, Bureau of Labor Statistics, Tomorrows Manpower Needs, Vol. 1, Developing Area Manpower Projections, BLS Bulletin No. 1606, 1969; Ibid, Supplement No. 4, Estimating Occupational Separations from the Labor Force for States; New Jersey Department of Labor and Industry, New Jersey's Manpower Challenge of the Eighties, 1975; Kentucky Department for Human Resources, Annual Manpower Planning Report, FY 1975.

Table B-1

Data Sources and Information Obtained for Kentucky and New Jersey Projections

Kentucky

Data Source	Information Obtained
1. Total Employment and Job Openings	
a. Kentucky Department of Human Resources, Annual Manpower Planning Report, FY 1975.	a. Total state employment by occupation, 1970, 1980; average annual job openings by occupation, 1970-80.
2. Sex and Race	
a. U.S. Department of Commerce, Bureau of the Census, Census of Population, 1970, Detailed Characteristics: Kentucky, PC (1) - D19.	a. Employment by sex 1960, 1970, and employment by race, 1970 for detailed occupations.
b. U.S. Department of Commerce, Bureau of the Census, Census of Population, 1960, Detailed Characteristics: Kentucky, PC(1)-D19.	b. Employment by race, 1960, for detailed occupations.
c. U.S. Department of Labor, 1975 Manpower Report of the President.	c. U.S. labor force by race 1960, 1970, and 1980.
d. National Planning Association, Regional Demographic Projections 1960-85, 1972.	d. Kentucky labor force by sex 1960, 1970, and 1980.
3. Educational Attainment	
a. See 2a above.	a. Employment by level of education for selected occupations, 1970.

Table B-1 (Continued)

Data Source	Information Obtained
4. Earnings	
a. See 2a and b above.	a. Median earnings for selected occupations and groups, 1960, 1970.
5. Vocational Education Data	
a. Kentucky Department of Education, Kentucky State Plan for the Administration of Vocational Education, 1975.	a. Completions from vocational programs, 1975 and 1980.
b. U.S. Department of Health, Education, and Welfare, Office of Education, "Enrollments in Vocational Education Programs," Kentucky, O.E. Form 3138, 1971.	b. Enrollment by sex in vocational programs, 1971.
New Jersey	
1. Total Employment and Job Openings	
a. New Jersey Department of Labor and Industry, New Jersey's Manpower Challenge of the Eighties, 1975.	a. Total state employment by occupation, 1970, 1980; average annual job openings, 1970-80.
2. Sex and Race	
a. U.S. Department of Commerce, Bureau of the Census, Census of Population, 1970, Detailed Characteristics: New Jersey, PC(1)-D32.	a. Employment by sex, 1960, 1970, and employment by race, 1970.

Table B-1 (Continued)

Data Source	Information Obtained
b. U.S. Department of Commerce, Bureau of the Census, Census of Population, 1960, Detailed Characteristics: New Jersey, PC(1) - D32.	b. Employment by race, 1960, for detailed occupations.
c. U.S. Department of Labor, Manpower Report of the President, 1975.	c. U.S. labor force by race, 1960, 1970, and 1980.
d. National Planning Association, Regional Demographic Projections 1960-85, 1972.	d. New Jersey labor force by sex, 1960, 1970, and 1980.
3. Educational Attainment	
a. See 2a above.	a. Employment by level of education for selected occupations, 1970.
4. Earnings	
a. See 2a and b above.	a. Median earnings for selected occupations and groups, 1960, 1970.
5. Vocational Education Data	
a. New Jersey Department of Education, Division of Vocational Education, unpublished enrollment data, 1975.	a. Projected enrollment in vocational programs, 1976.
b. U.S. Department of Health, Education and Welfare, Office of Education, "Enrollment in Vocational Education Programs," New Jersey, O.E. Form 3138, 1972.	b. Enrolled by sex in vocational programs, 1972.

Statistical Reliability of the Data

Apart from the availability of data, there is the question of its statistical reliability. Data from the Census relating to the indicators considered is based on a sample of the population, and as such is subject to statistical error as well as the usual reporting, coding, and classifying errors which occur in a complete enumeration. Published data for 1960 for states is based on a 25 percent sample, while data from the 1970 Census is from a 20 percent sample for the characteristics used in this study.

The Census Bureau has published tables indicating the range of statistical error given the number of persons in the population under investigation. When looking at state data, it is important to recognize that the error associated with percentages based on relatively small numbers can be substantial. For example, in the estimate that half of the workers in an occupation completed 12-15 years of education, the standard error at the 90 percent confidence level would be ± 2 percentage points if there were 10,000 employed in the occupation in 1970. Of the occupations studied, only about forty occupations in New Jersey and half that number in Kentucky had 10,000 persons employed in 1970. The standard error if total employment was 5,000 is ±3.5 percentage points. Therefore, the chances are 9 out of 10 that an estimate of 50 percent with 5,000 employed would fall between 46.5 and 53.5 percent.

Similar degrees of variation are present in the 1960 data. Therefore, in examining the change in representation of women or nonwhites in an occupation, it should be remembered that the reported "increase" in representation may, in fact, be larger or smaller than the "true" increase in the underlying population depending on the estimating errors arising from sampling fluctuations associated with the 1960 and 1970 data. Therefore, small changes in the representation of women or Negroes should be regarded as having questionable statistical significance in general, and in particular when associated with the smaller occupations, e.g., those with less than 5,000 persons employed.

Use of National Trend Data or Other Surrogate Measures for the State

There are two reasons why national trend data or other surrogate measures were used in making projections for the states. First, published data is not available for all occupations included in the study. Second, even if the data were available, the statistical reliability of the data may be such that it would provide an inaccurate statement of trend. For example, data on educational attainment and earnings for detailed occupational titles is not published for the states. Special tabulations can be obtained to provide the data for the majority of occupations; however, the question of accuracy must be considered. Census data at the national level is both more complete and statistically more reliable. In such cases, the more reliable trends shown in national data may be preferable to those reported in the state data.

Examination of the 1970 Census data for major occupations and groups indicates that, in terms of educational attainment, states can vary substantially from the national pattern. For example, Kentucky generally lags behind the U.S. in educational attainment, while New Jersey generally has somewhat higher levels. Even in states where there is currently a divergence from the national pattern, national data and projections may still be relevant, as there has been a narrowing of the "education gap" among the states. This is in part due to the migration of the population over time. In those areas in which the states are becoming more like the national norm over time, the trends in the national projections can supply useful benchmarks for state projections, and, in some instances, the need for special state projections diminishes. Table B-2 presents a comparison of the educational levels for selected occupations in Kentucky, New Jersey, and the U.S. for 1970. The data in the table underscores the fact that substantial differences as well as similarities exist between the state and national patterns.

Differences in occupational earnings among the states appear to be the result of differences in the overall level of earnings in the state rather than reflecting differentials in the relative earnings of different occupations within the state. That is, while the level of earnings may differ, the ratio of earnings in the occupation to earnings in the state or nation often vary within a fairly narrow range. Cost of living disparities are obviously an important factor in explaining the differences, as are differences in industrial make-up and union strength. Table B-3 presents a comparison of median earnings in the two states and nationally for selected occupations. What is important for purposes of comparison is the data showing ratio of median earnings in the occupation to median earnings in the state (or nation). Although the data in the table are far from conclusive, they suggest strong elements making for similarity in the structure of earnings-by-occupation between individual states and the entire nation.

Table B-2

Comparison of Educational Attainment of Workers in Kentucky, New Jersey and the United States for Major Occupational Groups and Selected Occupations, 1970

	Percent of Workers Completing Specified Years of Schooling In:								
	Kentucky			New Jersey			United States		
Major Occupational Group or Occupation	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More
Professional, technical, and kindred workers	7.0%	35.4%	57.6%	6.3%	37.2%	56.5%	6.2%	38.0%	55.8%
Registered nurses	11.8	74.3	13.9	6.4	78.7	14.9	8.8	74.6	16.6
Managers and administrators, except farm	29.9	50.6	19.5	20.7	49.8	29.5	22.6	54.1	23.3
Salesworkers	37.8	53.1	9.1	32.6	52.8	14.6	31.0	57.1	11.8
Salesworkers, retail trade	46.2	50.5	3.3	44.5	51.2	4.3	39.5	56.3	4.2
Clerical and kindred workers	21.4	74.0	4.5	25.3	70.4	4.3	21.1	73.8	5.1
Office machine operators	14.4	85.3	0.3	20.9	78.0	1.1	15.8	82.8	1.4
Secretaries, stenographers, and typists	8.6	88.0	3.4	12.4	85.1	2.5	9.8	86.1	4.1
Craftsmen	59.0	39.3	1.7	51.5	46.1	2.4	49.2	48.6	2.1
Carpenters	76.1	23.4	0.5	57.7	41.3	1.0	60.1	38.8	1.1
Construction craftsmen, except carpenters	65.3	34.1	0.6	57.6	41.5	0.9	55.3	43.7	1.0
Auto mechanics, including body repairmen	70.9	28.7	0.4	58.6	40.8	0.6	57.4	41.9	0.7
Mechanics and repairmen, except auto	56.7	42.3	1.0	47.7	51.1	1.2	45.3	53.3	1.4
Machinists	48.7	51.1	0.2	52.7	46.2	1.1	45.5	53.7	0.8
Metal craftsmen, except mechanics and machinists	51.0	48.1	0.9	52.7	46.4	0.9	48.5	50.6	0.9
Foremen	44.5	49.1	6.4	41.5	50.5	8.0	39.4	53.9	6.7
Operatives, except transportation	64.7	34.8	0.5	67.8	31.4	0.8	60.8	38.4	0.8
Assemblers	49.1	50.6	0.3	58.9	40.1	1.0	51.5	47.7	0.8
Precision machine operatives	61.1	38.4	0.5	59.8	39.4	0.8	52.6	46.7	0.7
Sewers and stitchers	67.5	32.5	-0-	82.6	16.9	0.5	69.7	29.9	0.4
Transportation equipment operatives	70.0	29.5	0.5	64.1	35.0	0.9	60.3	38.8	0.9
Truck drivers	76.0	23.7	0.3	69.2	30.2	0.6	65.8	33.7	0.5
Laborers, except farm	72.0	27.4	0.6	69.3	29.6	1.1	66.2	32.8	1.0
Farmers and farm managers	75.1	23.0	1.9	53.6	40.9	5.5	56.5	39.7	3.8
Farm laborers and farm foremen	84.0	15.2	0.8	70.2	27.9	1.9	74.9	23.9	1.5
Service workers, except private household	64.7	34.2	1.1	59.3	39.0	1.7	55.7	42.7	1.7
Food service workers	73.2	26.3	0.5	64.9	34.1	0.9	61.6	37.4	1.0
Practical nurses	35.1	63.8	1.1	29.1	69.9	1.0	29.1	69.9	1.0
Other health service workers	55.0	43.4	1.6	47.6	50.4	1.9	45.4	52.7	1.9
Protective service workers	51.9	45.9	2.2	40.4	56.2	3.4	35.2	61.3	3.5
All Occupations	48.2	41.8	10.0	39.5	46.2	14.4	37.2	50.4	12.4

Source: 1970 Census of Population

Table B-3

Comparison of Median Earnings of Full-Year Workers, New Jersey, Kentucky and United States, Selected Occupations, 1970

Occupation	New Jersey		Kentucky		United States	
	Earnings	Ratio to State Median	Earnings	Ratio to State Median	Earnings	Ratio to U.S. Median
Buyers, purchasing agents, sales managers	$12,524	1.59	$ 9,634	1.55	$11,011	1.55
Managers and administrators	13,815	1.75	10,484	1.69	11,846	1.67
Insurance agents, brokers, and underwriters 1/	11,994	1.52	9,781	1.58	10,688	1.50
Sales representatives, manufacturing 1/	13,434	1.70	10,670	1.72	11,933	1.68
Salesclerks, retail trade	4,986	0.63	4,286	0.69	4,678	0.66
Bookkeepers 2/	5,520	0.70	4,635	0.75	5,053	0.71
Secretaries 2/	5,775	0.73	4,750	0.77	5,486	0.77
Typists 2/	4,875	0.61	4,509	0.73	4,936	0.69
Carpenters 1/	8,978	1.14	6,540	1.05	7,850	1.10
Electricians 1/	9,967	1.26	9,294	1.50	9,663	1.36
Painters and paperhangers 1/	7,784	0.99	6,332	1.02	7,388	1.04
Plumbers and pipefitters 1/	9,869	1.25	9,073	1.46	9,386	1.32
Foremen	10,898	1.38	9,153	1.47	9,968	1.40
Air conditioning, heating, and refrigerator mechanics and repairmen 1/	9,315	1.18	8,030	1.29	8,535	1.20
Radio and T.V. mechanics and repairmen 1/	8,512	1.08	7,150	1.15	7,937	1.12
Sheetmetal workers and tinsmiths 1/	9,749	1.24	8,774	1.41	9,020	1.27
Tool and die makers 1/	10,391	1.32	9,192	1.48	10,503	1.48
Welders and flame cutters 1/	8,777	1.11	7,508	1.21	8,021	1.13
Firefighters 1/	9,699	1.23	7,598	1.22	9,543	1.34
Police and detectives 1/	9,357	1.19	7,189	1.16	9,155	1.29
All Occupations	7,889	-	6,207	-	7,114	-

1/ Median earnings for male workers only.
2/ Median earnings for female workers only.

Source: 1970 Census of Population.

National trend data, along with other surrogates, was also used in projecting the race indicator for some occupations. Consistent race data was only available for half the occupational titles because of redefinition of titles between the 1960 and 1970 Censuses and because 1960 race data was published for less than 100 occupations and groups. In some cases, the occupation was projected based on the projected movement of a similar occupation for which 1960 data was available. The use of the real estate agent and broker occupation to project real estate appraisers is an instance. In a number of occupations, the state projections were made based on the national trend for the occupation. Seventeen occupations in Kentucky and thirty-two in New Jersey were projected based on national trends.

National data, therefore, has varied uses in preparing occupational indicators for states. It can be used to compare the state's position for a particular characteristic relative to the U.S., it can act as a surrogate measure of future trends in the state, or be used to make state projections for individual occupations. The uses depend on the degree of similarity between the state and the U.S., the degree to which the state is expected to follow the national pattern in the future, and the statistical reliability of the state data in comparison with the national.

Deriving Benchmark Checks for the Projections

Undertaking comprehensive benchmark checks of the state projections does not appear feasible because of the lack of consistent state labor force projections and data gaps. The National Planning Association has prepared projections of state labor forces by sex; however, there are presently no systematic projections of state labor forces by race. The economic assumptions and the base year data in the National Planning Association projections is slightly different than that used by the BLS, and its use must, therefore, be limited.

In general, the shift in representation of women as projected by the NPA is mirrored in the study occupations. This is more true in New Jersey than in Kentucky. The proportion of women in Kentucky is projected to increase more rapidly than the labor force as a whole, but it also did so in the 1960 to 1970 period. It appears that the occupations with the most rapid growth are those in which women predominate in Kentucky. Women are projected to account for just over one half of the employment increase in the occupations studied; however, only 14 percent of this increase is expected to occur as a result of increased penetration of women in the occupations. 1/ Table B-4 compares the representation of women in the study occupations with the entire state based on the historical data from the Censuses, and projections by the NPA and The Conference Board. Employment by sex is not available for 1960 for New Jersey because the projected employment data was based on "place of work," and

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1/ See Table 2 of Kentucky conference material.

the New Jersey Department of Labor and Industry which prepared the 1970 and projected 1980 employment estimates by occupation did not recompute the 1960 Census data from its reported "place of residence" basis.

A preliminary guide to the anticipated changes in the racial composition of the state labor force can be derived by comparing the proportion of whites and Negroes in the state in 1960 and 1970 with the comparable national distribution, and estimating 1980 for the state based on this relationship and projections of the national labor force prepared by the Bureau of Labor Statistics. State estimates obtained in this manner cannot be used to verify occupational projections as they are derived from secondary sources and are only rough benchmarks themselves. Table B-5 presents the comparison of employment by race in the occupations studied with 1970 and projected 1980 employment for the two states. Data for 1960 is not shown, since it is available for only half the occupations.

Projected movements by sex and race in the occupations studied appear to be reasonable when compared with anticipated movements in the state labor forces of Kentucky and New Jersey. More information is needed, however, to improve the benchmark check procedure for states. Information on the recent patterns of geographic and occupational mobility by race and sex, in particular, would improve the empirical basis for the projections.

Table B-4

Comparison of Employment by Sex, Occupations Studied and All State Occupations for Kentucky and New Jersey, 1960, 1970, and Projected 1980

	1960		1970		1980	
	Male	Female	Male	Female	Male	Female
Kentucky						
Employment in Occupations Studied						
Number	377,976	101,284	378,554	157,944	442,717	224,783
Percent Distribution	78.9%	21.1%	70.6%	29.4%	66.3%	33.7%
Employment in All State Occupations						
Number	660,728	275,216	690,216	386,564	841,110	498,240
Percent Distribution	70.6%	29.4%	64.1%	35.9%	62.8%	37.2%
Employment in Occupations Studied as Percent of All State Occupations	57.2%	36.8%	54.8%	40.9%	52.6%	45.1%
New Jersey						
Employment in Occupations Studied						
Number	N.A.	N.A.	954,796	606,779	1,117,794	797,241
Percent Distribution	N.A.	N.A.	61.3%	38.7%	58.4%	41.6%
Employment in All State Occupations						
Number	N.A.	N.A.	1,665,987	999,592	1,923,834	1,298,672
Percent Distribution	N.A.	N.A.	62.5%	37.5%	59.7%	40.3%
Employment in Occupations Studied as Percent of All State Occupations	N.A.	N.A.	57.6%	60.7%	58.1%	61.4%

N.A. = Not Available

Table B-5

Comparison of Employment by Race, Occupations Studied and All State Occupations for Kentucky and New Jersey, 1970, and Projected 1980

	Kentucky			
	1970		1980	
	White	Negro	White	Negro
Employment in Occupations Studied				
Number	514,705	21,793	663,830	33,670
Percent Distribution	95.9%	4.1%	95.0%	5.0%
Employment in All State Occupations				
Number	1,004,635	72,145	1,238,900	100,450
Percent Distribution	93.3%	6.7%	92.5%	7.5%
Employment in Occupations Studied as Percent of All State Occupations	51.2%	30.2%	51.2%	33.5%
	New Jersey			
Employment in Occupations Studied				
Number	1,448,389	115,186	1,742,197	172,838
Percent Distribution	92.6%	7.4%	91.0%	9.0%
Employment in All State Occupations				
Number	2,412,349	253,230	2,858,367	364,143
Percent Distribution	90.5%	9.5%	88.7%	11.3%
Employment in Occupations Studied as Percent of All State Occupations	60.0%	45.5%	61.0%	47.5%

Conclusions Regarding Feasibility of Preparing State Indicators

Both states included in this study had existing projections of employment and job openings for occupations. The projections were based on techniques developed by the Bureau of Labor Statistics and were consistent with the BLS national model of the economy. These projections could be used without alteration or adjustment as a point of departure for developing demographic indicators for the occupations included in the study.

Less information on occupational characteristics of workers is currently available for states than is available at the national level. Existing data is sufficient to prepare projections for sex and race; however, special tabulations from the 1960 Census by race would decrease the number of occupations for which national trend or surrogate data need be used. Published data is not sufficient to prepare projections of educational attainment and earnings. Comparison of the two states and national data indicate that the relative rank of occupations in terms of earnings is fairly close, which indicates that national projections (which can be expected to be more statistically reliable) may be a good surrogate for state projections.

Educational attainment projections could be prepared, at least for the larger occupations, if special tabulations from the Censuses were obtained. States with educational attainment distributions similar to the entire labor force might consider using national projections as a surrogate. States with dissimilar patterns should examine the historical data to determine to what extent, if any, the state is becoming like the nation over time. If such a trend exists, national education projections could also be considered as benchmarks or possible surrogates. This would allow projections to be prepared for many occupations for which the state data was not sufficiently reliable.

A combination of state and national data on occupational characteristics can be used to develop occupational indicators for states which are comparable with the projections at the national level. While comparable, it is reasonable to expect that the state projections will generally be less reliable. This will be especially true for small occupations and in those instances in which surrogates are employed with only limited benchmarks based on original state data. However, the state projections can be improved by making use of special Census tabulations and by surveys. The usefulness of these indicators is that they can extend the range of manpower information currently available to state vocational planners beyond the traditional measures of employment and job openings by providing information on the sexual, racial, educational attainment, and earnings levels of occupations. Allowing for their imperfections, the indicators can serve as substitutes for subjective hunches about future labor force developments which are relevant for planning in vocational education.

APPENDIX C

STATISTICAL TABLES

Table C-1

Selected National Economic Framework Indicators, 1960, 1970 and Projected 1980 and 1985

Indicator	1960	1970	1980	1985	Average Annual Growth Rate 1960-70	1970-80	1980-85	1970-85
Population 14 years and over (in thousands)	127,334	151,067	174,734	182,932	1.7%	1.5%	0.9%	1.3%
14-24 years	27,334	40,539	44,858	41,615	4.0	1.0	-1.5	0.3
25-44 years	47,134	48,413	62,334	71,991	0.3	2.6	2.9	2.7
45 years and over	52,866	62,115	67,542	69,326	1.6	0.8	0.5	0.7
Total labor force (in thousands)	72,142	85,903	101,809	107,716	1.8	1.7	1.1	1.5
Civilian labor force (in thousands)	69,578	82,715	99,809	105,716	1.7	1.9	1.2	1.7
Civilian employment (in thousands)	65,778	78,627	95,817	101,487	1.8	2.0	1.2	1.7
Unemployment (in thousands)	3,852	4,088	3,992	4,229	0.6	-0.2	1.2	0.2
Unemployment rate	5.5%	4.9%	4.0%	4.0%	N.A.	N.A.	N.A.	N.A.
Gross National Product (billions of 1973 dollars)	$757.4	$1,114.9	$1,750.8	$2,051.4	3.9	4.6	3.2	4.2
Gross National Product per worker (1973 dollars)	$11,080	$13,625	$17,900	$19,820	2.1	2.8	2.1	2.5
Personal income 1/ (billions of 1973 dollars)	$568.6	$925.1	$1,431.7	$1,708.6	5.0	4.5	3.6	4.2
Personal income per worker (1973 dollars)	$8,320	$11,310	$14,635	$16,510	3.1	2.6	2.4	2.5
Average annual man-hours per worker, private economy	2,067	1,968	1,920	1,888	-0.5	-0.3	-0.3	-0.3

1/ Published figures were deflated using personal consumption expenditures deflator from Department of Commerce.

Sources: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Department of Commerce, Bureau of the Census.
Population projections based on Census Series E fertility projections.

Table C-2

Comparison of Occupations Included in Study With All Civilian Occupations, 1970 and Projected 1985

Indicator	1970 Occupations Studied	1970 All Occupations	1970 Occupations Studied as Percent of All Occupations	1985 Occupations Studied	1985 All Occupations	1985 Occupations Studied as Percent of All Occupations
Employment (in thousands)	43,399	78,627	55%	57,235	101,490	56%
Male	27,815	48,960	57	34,045	61,902	55
Female	15,585	29,667	53	23,191	39,588	59
White	39,888	70,182	57	51,356	88,869	58
Nonwhite	3,511	8,445	42	5,879	12,621	47
Years of school completed (in thousands)						
Less than 12 years	16,741	29,249	57	13,033	23,952	54
12-15 years	23,697	39,628	60	39,003	58,255	67
16 or more years	2,961	9,750	30	5,199	19,283	27
Median earnings 1/ (in 1973 dollars)	$8,725	$9,945	88	$13,870	$15,260	91

1/ Earnings figures refer to workers who worked 50 weeks or more during the year.

Sources: U.S. Department of Labor, Bureau of Labor Statistics; The Conference Board.

Table C-3

Median Earnings of Full-Year Workers in Study Occupations and Ratio of Occupational Median to Economy-wide Median, 1970 and Projected 1980 and 1985
(in 1973 dollars)

Occupation	Median Earnings			Ratio of Occupational Median to Economy-wide Median		
	1970	1980	1985	1970	1980	1985
Professional, technical, and kindred workers						
Computer programmers	$13,600	$18,240	$20,490	1.37	1.34	1.34
Designers	14,260	19,320	21,550	1.43	1.42	1.41
Drafters	11,200	16,210	18,100	1.13	1.19	1.19
Electrical and electronic engineering technicians	11,200	15,470	17,410	1.13	1.14	1.14
Engineering and science technicians, n.e.c.	10,650	14,670	16,460	1.07	1.08	1.08
Mechanical engineering technicians	13,430	18,500	20,760	1.35	1.36	1.36
Other technicians, except health	10,810	14,930	16,800	1.09	1.10	1.10
Personnel and labor relations workers	13,820	18,870	21,300	1.40	1.39	1.40
Recreation workers	9,330	12,490	13,880	0.94	0.92	0.91
Registered nurses	8,090	10,330	11,970	0.81	0.76	0.78
Therapists	9,630	12,020	13,820	0.97	0.88	0.91
Tool programmers, numerical control	12,620	17,390	19,520	1.27	1.28	1.28
Managers and administrators, except farm						
Bank officials and financial managers	15,990	22,600	22,540	1.61	1.66	1.67
Buyers and shippers, farm products	12,370	17,640	19,760	1.24	1.30	1.29
Buyers, wholesale, and retail trade	12,780	16,720	18,490	1.28	1.23	1.21
Managers and administrators, n.e.c.	16,770	23,200	26,040	1.69	1.70	1.71
Managers and superintendents, building	9,500	13,500	15,280	0.96	0.99	1.00
Restaurant, cafeteria, and bar managers	11,230	15,220	17,040	1.13	1.12	1.12
Sales managers and department heads, retail	12,780	16,720	18,490	1.28	1.23	1.21
Salesworkers						
Insurance agents, brokers, and underwriters	11,010	14,910	16,630	1.11	1.10	1.09
Real estate agents and brokers	12,820	18,290	20,720	1.29	1.34	1.37

Table C-3 (Continued)

Occupation	Median Earnings			Ratio of Occupational Median to Economy-wide Median		
	1970	1980	1985	1970	1980	1985
Sales representatives, manufacturing	$15,540	$22,760	$26,110	1.56	1.67	1.71
Sales representatives, wholesale	13,690	18,950	21,030	1.38	1.39	1.38
Salesclerks, retail trade	6,470	8,380	9,480	0.65	0.62	0.62
Salesworkers, retail trade	11,090	14,350	16,230	1.11	1.05	1.06
Salespeople, service and construction	11,852	16,330	18,310	1.19	1.20	1.20
Stock and bond sales agents	23,070	32,600	36,840	2.32	2.40	2.41
Clerical and kindred workers						
Billing clerks	7,500	9,850	10,990	0.75	0.72	0.72
Bookkeepers	6,530	8,600	9,600	0.66	0.63	0.63
Bookkeeping and billing machine operators	6,440	8,450	9,400	0.65	0.62	0.62
Calculating machine operators	6,730	8,830	9,850	0.68	0.65	0.65
Computer and peripheral equipment operators	9,170	12,170	13,430	0.92	0.89	0.88
Insurance adjustors, examiners, and investigators	10,920	14,780	16,490	1.10	1.09	1.08
Keypunch operators	6,800	9,020	10,100	0.68	0.66	0.66
Miscellaneous clerical workers	8,120	10,660	11,890	0.82	0.78	0.78
Office machine operators, n.e.c.	6,600	8,670	9,670	0.66	0.64	0.63
Payroll and timekeeping clerks	7,870	10,340	11,530	0.79	0.76	0.76
Real estate appraisers	15,450	22,040	24,970	1.55	1.62	1.64
Secretaries, legal, medical and other	6,860	9,040	10,100	0.69	0.66	0.66
Shipping and receiving clerks	8,080	10,750	12,040	0.81	0.79	0.79
Statistical clerks	8,230	10,805	12,053	0.83	0.79	0.79
Stenographers	7,520	10,190	11,490	0.76	0.75	0.75
Stock clerks and storekeepers	9,813	14,230	16,050	0.99	1.05	1.05
Tabulating machine operators	7,590	9,960	11,110	0.76	0.73	0.73
Typists	6,070	7,970	8,890	0.61	0.59	0.58
Craftsmen and kindred workers						
Air conditioning, heating and refrigeration mechanics	10,760	14,240	15,800	1.08	1.05	1.04
Aircraft mechanics and repairers	11,440	19,680	22,310	1.15	1.45	1.46
Auto body repairers	9,740	12,850	14,250	0.98	0.95	0.93

Table C-3 (Continued)

Occupation	Median Earnings			Ratio of Occupational Median to Economy-wide Median		
	1970	1980	1985	1970	1980	1985
Auto mechanics	$ 9,070	$11,970	$13,270	0.91	0.88	0.87
Brickmasons and stonemasons	10,610	14,130	15,690	1.07	1.04	1.03
Bulldozer operators	9,240	12,360	13,780	0.93	0.91	0.90
Cabinetmakers	8,230	10,650	11,720	0.83	0.78	0.77
Carpenters	9,720	12,940	14,390	0.98	0.95	0.94
Carpenter apprentices	7,560	10,040	11,150	0.76	0.74	0.73
Crane, derrick and hoist operators	10,720	14,340	15,970	1.08	1.05	1.05
Data processing machine repairers	12,410	17,140	19,290	1.25	1.26	1.26
Decorators and window dressers	7,780	10,280	11,380	0.78	0.76	0.75
Electricians	11,780	15,690	17,450	1.18	1.15	1.14
Electric power line and cable workers	11,390	15,550	18,740	1.15	1.15	1.23
Excavating, grading, and road machine operators	9,770	13,070	14,580	0.98	0.96	0.96
Farm implement mechanics and repairers	8,050	10,620	11,780	0.81	0.78	0.77
Foremen	12,320	17,020	19,160	1.24	1.25	1.26
Heavy equipment mechanics, including diesel	10,300	13,590	15,070	1.04	1.00	0.99
Job and die setters, metal	10,660	15,330	17,090	1.07	1.13	1.12
Machinists	10,400	14,930	16,640	1.05	1.10	1.09
Machinist apprentices	8,240	11,850	13,200	0.83	0.87	0.87
Miscellaneous mechanics and repairers	9,680	13,840	15,370	0.97	1.02	1.01
Painter apprentices	7,580	10,290	11,520	0.76	0.76	0.75
Painters, construction and maintenance	9,040	11,990	13,310	0.91	0.88	0.87
Paperhangers	10,380	14,580	16,500	1.04	1.07	1.08
Pattern and model makers, except paper	12,580	18,260	20,420	1.27	1.34	1.34
Photoengravers and lithographers	12,500	16,090	18,000	1.26	1.18	1.18
Plumbers and pipefitters	11,570	15,490	17,260	1.16	1.19	1.13
Printing press apprentices	9,400	12,080	13,510	0.95	0.89	0.89
Printing press operators	10,580	13,600	15,200	1.06	1.00	1.00
Printing trades apprentices, except print pressmen	7,380	9,490	10,610	0.74	0.70	0.70
Radio and T.V. repairers	9,520	12,630	14,030	0.96	0.93	0.92

Table C-3 (Continued)

Occupation	Median Earnings			Ratio of Occupational Median to Economy-wide Median		
	1970	1980	1985	1970	1980	1985
Sheetmetal apprentices	$ 8,270	$11,960	$13,360	0.83	0.88	0.88
Sheetmetal workers and tinsmiths	10,920	15,890	17,780	1.10	1.17	1.17
Structural metal craftsmen	9,190	11,990	12,890	0.92	0.88	0.84
Telephone installers and repairers	11,150	15,270	18,350	1.12	1.12	1.20
Telephone linemen and splicers	10,230	14,010	16,830	1.03	1.03	1.10
Tilesetters	10,090	13,430	14,910	1.01	0.99	0.98
Upholsterers	7,820	10,310	11,400	0.79	0.76	0.75
Operatives						
Assemblers	7,590	10,140	11,280	0.76	0.75	0.74
Bus drivers	8,950	12,590	14,310	0.90	0.93	0.94
Checkers, examiners, and inspectors, manufacturing	8,370	11,370	12,720	0.84	0.84	0.83
Cutting operatives, n.e.c.	7,980	11,540	12,890	0.80	0.85	0.84
Delivery and route workers	9,060	11,610	12,720	0.91	0.85	0.83
Dressmakers and seamstresses, except factory	4,390	5,960	6,650	0.44	0.44	0.44
Drill press operatives	8,670	12,540	14,010	0.87	0.92	0.92
Graders and sorters, manufacturing	6,450	8,560	9,590	0.65	0.63	0.63
Grinding machine operatives	10,130	14,650	16,370	1.02	1.08	1.07
Lathe and milling machine operatives	9,950	14,400	16,080	1.00	1.06	1.05
Painters, manufactured articles	8,440	12,140	13,530	0.85	0.89	0.89
Other precision machine operatives	10,070	14,460	16,110	1.01	1.06	1.06
Punch and stamping press operatives	8,490	12,290	13,720	0.85	0.90	0.90
Sawyers	7,030	10,120	11,290	0.71	0.75	0.74
Sewers and stitchers	4,880	6,160	6,970	0.49	0.45	0.46
Solderers	6,560	9,370	10,410	0.66	0.69	0.68
Truck drivers	9,640	14,050	16,160	0.97	1.03	1.06
Welders and flame cutters	9,640	13,760	15,290	0.97	1.01	1.00
Service workers						
Bartenders	7,700	9,840	10,810	0.77	0.72	0.71
Cooks, except private household	5,470	7,620	8,570	0.55	0.56	0.56

Table C-3 (Continued)

Occupation	Median Earnings			Ratio of Occupational Median to Economy-wide Median		
	1970	1980	1985	1970	1980	1985
Childcare workers, except private household	$ 3,840	$ 5,000	$ 5,500	0.37	0.37	0.36
Crossing guards and bridge tenders	6,750	8,420	9,230	0.68	0.62	0.60
Firefighters	11,610	16,000	18,130	1.17	1.18	1.19
Food service workers, n.e.c., except private household	4,430	6,170	6,930	0.45	0.45	0.45
Hairdressers and cosmetologists	5,770	7,770	8,650	0.58	0.57	0.57
Health aides, except nursing	5,440	6,730	7,720	0.55	0.50	0.51
Housekeepers, except private household	6,470	8,210	9,000	0.65	0.60	0.59
Marshals and constables	9,260	12,730	14,420	0.93	0.94	0.95
Nursing aides, orderlies and attendants	4,890	6,050	6,940	0.49	0.44	0.45
Police and detectives	11,100	15,270	17,300	1.12	1.12	1.13
Practical nurses	5,870	7,650	8,910	0.59	0.56	0.58
School monitors	3,870	5,170	5,640	0.39	0.38	0.37
Sheriffs and bailiffs	9,520	12,880	14,500	0.96	0.95	0.95
Laborers, except farm						
Carpenter helpers	6,410	8,880	10,000	0.64	0.65	0.66
Gardeners and groundskeepers, except farm	6,830	9,290	10,380	0.69	0.68	0.68
Farm occupations						
Farm foremen	8,360	11,790	14,620	0.84	0.87	0.96
Farm managers	10,210	15,200	19,210	1.03	1.12	1.26
Farm laborers, wage workers	4,750	7,080	8,950	0.48	0.52	0.59
Farmers, owners and tenants	7,780	12,340	15,910	0.78	0.91	1.04
All U.S. Occupations	9,945	13,600	15,260	N.A.	N.A.	N.A.

Note: Earnings refer to persons who worked 50 weeks or more. Figures adjusted to 1973 dollars using personal consumption expenditures deflator from Department of Commerce.

Sources: 1970 Census of Population; The Conference Board.

Table C-4

Employment in 1960 and 1970 and Projected 1980 and 1985, Occupations Included in Study
(in thousands)

Occupation	Employment				Average Annual Growth Rate			
	1960	1970	1980	1985	1960-70	1970-80	1970-85	1980-85
Professional, technical, and kindred workers	1,209	2,117	3,224	3,745	5.8%	4.3%	3.9%	3.0%
Computer programmers	9	177	250	290	2/	3.5	3.4	3.0
Designers	74	120	164	178	4.9	3.2	2.7	1.7
Drafters	231	316	425	485	3.2	3.0	2.9	2.7
Electrical and electronic engineering technicians	103	154	237	317	4.1	4.4	4.9	6.0
Engineering and science technicians, n.e.c.	109	190	355	525	5.7	6.5	7.0	8.1
Mechanical engineering technicians	12	12	15	18	0.0	0.2	2.7	4.4
Other technicians, except health	4	37	77	95	2/	7.6	6.5	4.3
Personnel and labor relations workers	100	286	478	550	11.0	5.3	4.5	2.8
Recreation workers	33	60	92	105	6.2	4.4	3.8	2.7
Registered nurses	503	680	980	1,000	3.1	3.7	2.6	0.4
Therapists	27	82	147	178	11.8	6.1	5.3	3.9
Tool programmers, numerical control	4	3	4	4	-2.8	2.9	2.3	1.0
Managers and administrators, except farm	6,186	5,760	7,830	7,917	-0.7	3.1	2.1	0.2
Bank officials and financial managers	200	398	600	646	7.1	4.2	3.3	1.5
Buyers and shippers, farm products	37	25	20	20	-3.8	-2.1	-1.5	-0.1
Buyers, wholesale, and retail trade	82	155	210	226	6.6	3.1	2.6	1.5
Managers and administrators, n.e.c.	5,256	4,344	5,906	5,879	-1.9	3.1	2.0	-0.1
Managers and superintendents, building	53	100	150	173	6.7	4.2	3.7	2.8
Restaurant, cafeteria, and bar managers	412	463	553	545	1.2	1.8	1.1	-0.3
Sales managers and department heads, retail	146	275	391	428	6.6	3.6	3.0	1.8
Salesworkers	4,112	4,608	5,862	6,107	1.1	2.4	1.9	0.8
Insurance agents, brokers, and underwriters	328	412	523	576	2.3	2.4	2.3	1.9
Real estate agents and brokers	234	316	414	450	3.1	2.7	2.4	1.7
Sales representatives, manufacturing	443	394	476	493	1.7	1.9	1.5	0.7
Sales representatives, wholesale	493	635	810	837	2.6	2.5	1.9	0.6
Salesclerks, retail trade	2,031	2,190	2,782	2,825	0.8	2.4	1.7	0.3
Salesworkers, retail trade	408	407	497	523	1/	2.0	1.7	1.0
Salespeople, service and construction	140	151	219	250	0.8	3.8	3.4	2.7
Stock and bond sales agents	35	103	141	153	11.4	3.2	2.7	1.7
Clerical and kindred workers	4,975	8,139	10,743	11,861	5.0	2.8	2.5	2.0

Table C-4 (Continued)

Occupation	Employment				Average Annual Growth Rate			
	1960	1970	1980	1985	1960-70	1970-80	1970-85	1980-85
Billing clerks	51	123	193	220	9.2%	4.6%	3.9%	2.6%
Bookkeepers	921	1,540	1,850	1,900	5.3	1.8	1.4	0.5
Bookkeepers and billing machine operators	55	69	85	93	2.3	2.2	2.1	1.7
Calculating machine operators	35	34	37	37	-0.3	0.7	0.6	0.2
Computer and peripheral equipment operators	2	150	246	289	2/	5.1	4.5	3.3
Insurance adjustors, examiners, and investigators	61	105	136	152	5.6	2.6	2.5	2.3
Keypunch operators	174	300	265	242	5.6	-1.2	-1.4	-1.8
Miscellaneous clerical workers	292	447	715	748	4.3	4.8	3.5	0.9
Office machine operators, n.e.c.	29	52	77	88	5.9	4.0	3.6	2.6
Payroll and timekeeping clerks	121	175	223	238	3.8	2.4	2.1	1.4
Real estate appraisers	16	24	34	38	4.1	3.4	3.1	2.5
Secretaries, legal, medical and other	1,511	2,785	4,042	4,786	6.3	3.8	3.7	3.4
Shipping and receiving clerks	329	438	500	504	2.9	1.3	0.9	0.8
Statistical clerks	163	291	350	375	6.0	1.9	1.7	1.4
Stenographers	269	128	96	78	-7.2	-2.8	-3.2	-4.1
Stock clerks and storekeepers	401	496	626	670	2.2	2.3	2.0	1.4
Tabulating machine operators	26	9	4	3	-10.0	-6.9	-7.1	-7.4
Typists	519	973	1,264	1,400	6.5	2.7	2.5	2.1
Craftsmen and kindred workers	6,463	8,232	9,796	10,637	2.4	1.7	1.7	1.7
Air conditioning, heating and refrigeration mechanics	71	130	215	265	6.2	5.2	4.9	4.3
Aircraft mechanics and repairers	93	120	160	190	2.6	2.9	3.1	3.5
Auto body repairers	111	159	175	187	3.6	1.0	1.1	1.3
Auto mechanics	604	837	975	1,050	3.3	1.5	1.5	1.5
Brickmasons and stonemasons	167	172	205	235	0.3	1.8	2.1	2.8
Bulldozer operators	98	100	121	150	0.2	1.9	2.7	4.4
Cabinetmakers	76	75	83	83	-0.1	1.0	0.7	1/
Carpenters	832	985	1,125	1,200	1.7	1.3	1.3	1.3
Carpenter apprentices	7	9	11	12	2.6	2.1	2.0	1.7
Crane, derrick and hoist operators	137	170	194	199	2.2	1.3	1.1	0.6
Data processing machine repairers	-0-	36	73	93	2/	7.3	6.5	5.1
Decorators and window dressers	51	70	96	101	3.3	3.3	2.5	1.0
Electricians	339	450	581	650	2.9	2.6	2.5	2.3
Electric power line and cable workers	75	100	113	120	2.9	1.3	1.2	1.1
Excavating, grading, and road machine operators	203	280	346	420	3.3	2.1	2.7	3.9

Table C-4 (Continued)

Occupation	Employment				Average Annual Growth Rate			
	1960	1970	1980	1985	1960-70	1970-80	1970-85	1980-85
Farm implement mechanics and repairers	57	46	50	52	-2.0%	0.8%	0.8%	0.8%
Foremen	1,017	1,375	1,562	1,675	3.1	1.3	1.3	1.4
Heavy equipment mechanics, including diesel	322	687	875	934	7.9	2.5	2.1	1.3
Job and die setters, metal	63	100	135	146	4.8	3.1	2.6	1.6
Machinists	448	361	400	465	-2.1	1.0	1.0	3.0
Machinist apprentices	12	10	11	12	-2.1	1.1	0.9	0.5
Miscellaneous mechanics and repairers	151	158	189	197	0.5	1.8	1.5	0.8
Painter apprentices	2	2	2	2	-0.6	0.6	1.5	3.3
Painters, construction and maintenance	415	400	436	445	-4.0	0.9	0.7	0.4
Paperhangers	23	10	14	15	-8.1	3.2	2.7	1.8
Pattern and model makers, except paper	44	42	41	39	-0.4	-0.3	-0.5	-0.9
Photoengravers and lithographers	27	36	46	50	2.2	3.2	2.7	1.8
Plumbers and pipefitters	300	355	460	500	1.7	2.6	2.3	1.7
Printing press apprentices	1	3	4	4	2/	3.9	2.4	-0.5
Printing press operators	73	139	165	170	6.7	1.7	1.4	0.7
Printing trades apprentices, except print pressmen	10	6	4	3	-4.5	-4.0	-4.5	-5.6
Radio and T.V. repairers	100	137	150	167	3.3	0.9	1.3	2.2
Sheetmetal apprentices	4	6	8	8	3.4	3.2	2.5	1.2
Sheetmetal workers and tinsmiths	139	155	162	163	1.1	0.5	0.3	0.1
Structural metal craftsmen	63	79	100	112	2.3	2.4	2.4	2.3
Telephone installers and repairers	177	280	339	348	4.7	1.9	1.3	0.5
Telephone linemen and splicers	41	52	53	54	2.3	0.2	0.3	0.4
Tilesetters	43	32	36	38	-2.9	1.2	1.2	1.1
Upholsterers	67	68	81	83	0.1	1.8	1.3	0.4
Operatives	5,785	6,889	8,029	8,319	1.8	1.5	1.3	0.7
Assemblers	707	944	1,068	1,100	2.9	1.2	1.0	0.6
Bus drivers	174	229	297	315	2.8	2.6	2.1	1.2
Checkers, examiners, and inspectors, manufacturing	516	690	811	830	3.0	1.6	1.2	0.5
Cutting operatives, n.e.c.	197	239	288	297	2.0	1.9	1.5	0.6
Delivery and route workers	591	817	965	1,008	3.3	1.7	1.4	0.9
Dressmakers and seamstresses, except factory	138	110	107	104	-2.2	-0.3	-0.4	-0.5
Drill press operatives	61	76	88	91	2.3	1.5	1.2	0.7
Graders and sorters, manufacturing	43	45	51	51	0.6	1.2	0.8	1/
Grinding machine operatives	83	145	180	192	5.7	2.2	1.9	1.3
Lathe and milling machine operatives	100	155	182	189	4.5	1.6	1.3	0.8

Table C-4 (Continued)

Occupation	Employment 1960	1970	1980	1985	Average Annual Growth Rate 1960-70	1970-80	1970-85	1980-85
Painters, manufactured articles	174	178	190	197	0.3%	0.6%	0.7%	0.7%
Other precision machine operatives	47	77	100	109	5.1	2.7	2.4	1.7
Punch and stamping press operatives	166	180	214	222	0.8	1.8	1.4	0.7
Sawyers	113	120	144	145	0.6	1.8	1.3	0.2
Sewers and stitchers	813	926	1,045	1,048	1.3	1.2	0.8	0.1
Solderers	66	42	29	24	-4.3	-3.6	-3.7	-4.0
Truck drivers	1,438	1,378	1,581	1,627	-0.4	1.4	1.1	0.6
Welders and flame cutters	358	538	689	770	4.2	2.5	2.4	2.3
Service workers	2,683	4,354	5,924	6,686	5.0	3.0	2.9	2.5
Bartenders	172	189	222	235	0.9	1.6	1.5	1.2
Cooks, except private household	562	821	950	1,000	3.9	1.5	1.3	1.0
Childcare workers, except private household	96	339	483	546	13.5	3.6	3.2	2.5
Crossing guards and bridge tenders	31	46	52	54	4.1	1.2	1.1	0.8
Firefighters	140	181	258	315	2.6	3.6	3.8	4.0
Food service workers, n.e.c., except private household	244	389	483	512	4.8	2.2	1.8	1.2
Hairdressers and cosmetologists	301	480	600	662	4.8	2.3	2.2	2.0
Health aides, except nursing	35	133	249	280	14.3	6.5	5.1	2.3
Housekeepers, except private household	72	111	161	179	4.4	3.8	3.2	2.2
Marshals and constables	6	6	8	9	-0.6	3.1	2.9	2.4
Nursing aides, orderlies and attendants	465	834	1,203	1,360	6.0	3.7	3.3	2.5
Police and detectives	269	388	520	588	3.8	2.9	2.8	2.5
Practical nurses	260	370	641	835	3.6	5.6	5.6	5.4
School monitors	2	27	40	50	2/	4.2	4.3	4.6
Sheriffs and bailiffs	28	40	54	61	3.7	3.1	2.9	2.5
Laborers, except farm	515	654	631	625	2.4	-0.4	-0.3	-0.2
Carpenter helpers	99	117	81	70	1.7	-3.7	-3.4	-2.8
Gardeners and groundskeepers, except farm	416	537	550	555	2.6	0.3	0.2	0.2
Farm occupations	4,686	2,651	1,681	1,339	-5.5	-4.5	-4.5	-4.5
Farm foremen	24	31	27	25	2.6	-1.6	-1.4	-1.1
Farm managers	13	33	45	46	9.8	3.1	2.3	0.5
Farm laborers, wage workers	1,404	897	536	401	-4.4	-5.0	-5.2	-5.6
Farmers, owners and tenants	3,245	1,690	1,073	867	-6.3	-4.4	-4.4	-3.7

Table C-4 (Continued)

Occupation	Employment				Average Annual Growth Rate			
	1960	1970	1980	1985	1960-70	1970-80	1970-85	1980-85
Total, All Occupations Studied	36,612	43,399	53,720	57,235	1.7%	2.2%	1.9%	1.3%
Total, All U.S. Occupations	65,778	78,627	95,817	101,490	1.8	2.0	1.7	1.2

1/ Less than 0.1% growth rate.

2/ Calculation of growth rate not meaningful because of low base year figure.

Note: Details may not add to total due to rounding.

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Table C-5

Projected Average Annual Job Openings, 1970 to 1985, Occupations Included in Study

Occupation	Average Annual Job Openings, 1970-85		
		Job Openings Due To:	
	Total	Growth	Attrition
Professional, technical and kindred workers	204,000	108,700	95,300
Computer programmers	12,300	7,600	4,700
Designers	7,700	3,900	3,800
Drafters	17,000	11,300	5,700
Electrical and electronic engineering technicians	13,300	10,900	2,400
Engineering and science technician , n.e.c.	29,700	22,300	7,400
Mechanical engineering technicians	600	400	200
Other technicians, except health	5,300	3,900	1,400
Personnel and labor relations workers	29,100	17,600	11,500
Recreation workers	6,000	3,000	3,000
Registered nurses	70,300	21,300	49,000
Therapists	12,600	6,400	6,200
Tool programmers, numerical control	100	100	-0-
Managers and administrators, except farm	344,200	143,300	200,900
Bank officials and financial managers	30,300	13,700	16,500
Buyers and shippers, farm products	400	-300	800
Buyers, wholesale, and retail trade	11,800	7,000	4,700
Managers and administrators, n.e.c.	247,500	102,300	145,200
Managers and superintendents, building	13,000	4,900	8,200
Restaurant, cafeteria, and bar managers	22,300	5,500	16,800
Sales managers and department heads, retail	18,900	10,200	8,700
Salesworkers	316,500	100,000	216,500
Insurance agents, brokers, and underwriters	23,700	10,900	12,800
Real estate agents and brokers	26,900	8,900	17,900
Sales representatives, manufacturing	16,800	6,600	10,200
Sales representatives, wholesale	31,200	13,500	17,700
Salesclerks, retail trade	175,500	42,300	133,200

Table C-5 (Continued)

Occupation	Average Annual Job Openings, 1970-85		
		Job Openings Due To:	
	Total	Growth	Attrition
Salesworkers, retail trade	21,400	7,700	13,700
Salespeople, service and construction	14,000	6,600	7,400
Stock and bond sales agents	7,000	3,300	3,600
Clerical and kindred workers	794,700	228,200	566,500
Billing clerks	16,500	6,500	10,000
Bookkeepers	117,000	24,000	93,000
Bookkeeping and billing machine operators	6,700	1,600	5,100
Calculating machine operators	2,400	200	2,200
Computer and peripheral equipment operators	14,400	9,300	5,100
Insurance adjustors, examiners, and investigators	6,800	3,100	3,700
Keypunch operators	13,900	-3,900	17,700
Miscellaneous clerical workers	50,200	20,100	30,100
Office machine operators, n.e.c.	6,000	2,400	3,600
Payroll and timekeeping clerks	14,300	4,200	10,100
Real estate appraisers	2,000	900	1,100
Secretaries, legal, medical and other	364,800	113,400	251,400
Shipping and receiving clerks	15,100	4,400	10,700
Statistical clerks	22,200	5,600	16,600
Stenographers	3,700	-3,300	7,100
Stock clerks and storekeepers	27,300	11,600	15,700
Tabulating machine operators	1/	-400	200
Typists	111,600	28,500	83,100
Craftsmen and kindred workers	342,100	161,500	181,000
Air conditioning, heating and refrigeration mechanics	12,200	9,000	3,200
Aircraft mechanics and repairers	6,700	4,700	2,100
Auto body repairers	3,900	1,900	2,000
Auto mechanics	29,000	14,200	14,800
Brickmasons and stonemasons	7,400	4,200	3,200
Bulldozer operators	5,400	3,300	2,000
Cabinetmakers	2,800	500	2,300

Table C-5 (Continued)

Occupation	Average Annual Job Openings, 1970-85		
	Total	Job Openings Due To:	
		Growth	Attrition
Carpenters	40,100	14,300	25,700
Carpenter apprentices	500	200	300
Crane, derrick and hoist operators	5,100	1,900	3,200
Data processing machine repairers	4,200	3,800	400
Decorators and window dressers	5,900	2,100	3,800
Electricians	23,100	13,300	9,800
Electric power line and cable workers	2,400	1,300	1,100
Excavating, grading, and road machine operators	15,300	9,300	6,000
Farm implement mechanics and repairers	1,400	400	1,100
Foremen	51,800	20,000	31,800
Heavy equipment mechanics, including diesel	31,100	16,500	14,600
Job and die setters, metal	5,100	3,100	2,000
Machinists	15,200	6,900	8,300
Machinist apprentices	300	100	200
Miscellaneous mechanics and repairers	8,800	3,700	5,200
Painter apprentices	100	-0-	100
Painters, construction and maintenance	14,200	3,000	11,200
Paperhangers	800	300	500
Pattern and model makers, except paper	700	-200	900
Photoengravers and lithographers	2,000	1,100	900
Plumbers and pipefitters	18.300	9,700	8,700
Printing press apprentices	100	100	-0-
Printing press operators	4,900	2,100	2,800
Printing trades apprentices, except print pressmen	1/	-200	100
Radio and T.V. repairers	4,400	2,000	2,400
Sheetmetal apprentices	300	200	100
Sheetmetal workers and tinsmiths	3,100	500	2,600
Structural metal craftsmen	3,600	2,200	1,400
Telephone installers and repairers	7,400	4,500	2,900
Telephone linemen and splicers	500	100	400

Table C-5 (Continued)

Occupation	Average Annual Job Openings, 1970-85		
		Job Openings Due To:	
	Total	Growth	Attrition
Tilesetters	900	400	500
Upholsterers	3,200	1,000	2,200
Operatives	307,500	95,300	212,200
Assemblers	44,500	10,400	34,100
Bus drivers	13,800	5,700	8,100
Checkers, examiners, and inspectors, manufacturing	35,300	9,300	26,000
Cutting operatives, n.e.c.	11,400	3,900	7,500
Delivery and route workers	27,100	12,700	14,400
Dressmakers and seamstresses, except factory	7,500	-400	7,900
Drill press operatives	3,000	1,000	2,000
Graders and sorters, manufacturing	2,400	400	2,000
Grinding machine operatives	6,400	3,100	3,300
Lathe and milling machine operatives	5,400	2,300	3,200
Painters, manufactured articles	5,000	1,300	3,800
Other precision machine operatives	4,000	2,200	1,800
Punch and stamping press operatives	7,900	2,800	5,100
Sawyers	4,800	1,700	3,100
Sewers and stitchers	64,700	8,100	56,600
Solderers	300	-1,200	1,500
Truck drivers	38,000	16,600	21,400
Welders and flame cutters	26,000	15,500	10,500
Service workers	428,800	155,500	273,300
Bartenders	10,200	3,100	7,100
Cooks, except private household	52,300	11,900	40,300
Childcare workers, except private household	43,500	13,800	29,700
Crossing guards and bridge tenders	3,800	500	3,300
Firefighters	11,700	8,900	2,800
Food service workers, n.e.c., except private household	31,300	8,200	23,100
Hairdressers and cosmetologists	49,100	12,100	37,000
Health aides, except nursing	22,000	9,800	12,200

Table C-5 (Continued)

Occupation	Average Annual Job Openings, 1970-85		
		Job Openings Due To:	
	Total	Growth	Attrition
Housekeepers, except private household	12,700	4,500	8,100
Marshals and constables	500	200	300
Nursing aides, orderlies and attendants	97,200	35,100	62,100
Police and detectives	19,300	13,300	6,000
Practical nurses	69,300	31,000	38,300
School monitors	3,000	1,600	1,400
Sheriffs and bailiffs	2,900	1,400	1,500
Laborers, except farm	20,300	-1,900	22,200
Carpenter helpers	1/	-3,100	1,500
Gardeners and groundskeepers, except farm	21,900	1,200	20,700
Farm occupations	1/	-87,500	80,700
Farm foremen	400	-400	800
Farm managers	2,100	900	1,200
Farm laborers, wage workers	1/	-33,100	19,200
Farmers, owners and tenants	4,600	-54,900	59,500
Total, All Occupations Studied	2,753,000	905,000	1,848,000
Total, All U.S. Occupations	4,946,000	1,524,000	3,422,000
Occupations Studied as a Percent of All U.S. Occupations	56%	59%	54%

1/ Job openings resulting from attrition are exceeded by projected decline in employment.

Note: Details may not add to totals due to rounding.

Sources: U.S. Department of Labor; The Conference Board.

Table C-6

Employment in 1970 and Projected 1980 and 1985, Distributed by Sex, Occupations Included in Study
(in thousands)

Occupation	Employment					
	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Professional, technical, and kindred workers	1,148	968	1,763	1,461	2,152	1,595
Computer programmers	136	40	200	50	236	54
Designers	92	28	118	46	124	54
Drafters	291	25	380	45	428	57
Electrical and electronic engineering technicians	145	9	221	16	294	23
Engineering and science technicians, n.e.c.	156	34	283	72	411	115
Mechanical engineering technicians	12	1/	14	1	17	1
Other technicians, except health	33	4	67	10	82	13
Personnel and labor relations workers	197	89	337	141	392	158
Recreation workers	36	24	61	31	73	32
Registered nurses	18	662	27	954	28	972
Therapists	30	52	53	94	64	114
Tool programmers, numerical control	2	1	3	1	3	2
Managers and administrators, except farm	4,879	881	6,745	1,084	6,765	1,152
Bank officials and financial managers	329	69	472	128	495	151
Buyers and shippers, farm products	24	1	19	1	19	1
Buyers, wholesale, and retail trade	118	37	158	52	180	46
Managers and administrators, n.e.c.	3,840	504	5,286	620	5,291	588
Managers and superintendents, building	59	41	93	57	110	63
Restaurant, cafeteria, and bar managers	327	136	424	129	350	195
Sales managers and department heads, retail	182	93	294	97	320	108
Salesworkers	2,848	1,759	3,479	2,382	3,577	2,530
Insurance agents, brokers, and underwriters	361	51	442	81	479	97
Real estate agents and brokers	214	102	245	168	248	202
Sales representatives, manufacturing	361	33	445	31	465	28
Sales representatives, wholesale	594	41	740	71	754	83

Table C-6 (Continued)

Occupation	Employment 1970 Male	1970 Female	1980 Male	1980 Female	1985 Male	1985 Female
Salesclerks, retail trade	771	1,419	938	1,845	929	1,896
Salesworkers, retail trade	355	52	423	74	439	84
Salespeople, service and construction	100	52	122	97	129	121
Stock and bond sales agents	93	9	125	16	134	19
Clerical and kindred workers	1,775	6,363	2,094	8,644	2,128	9,733
Billing clerks	23	100	35	158	40	180
Bookkeepers	276	1,264	355	1,495	378	1,522
Bookkeeping and billing machine operators	7	61	9	77	9	84
Calculating machine operators	3	31	6	31	7	30
Computer and peripheral equipment operators	106	44	160	86	180	109
Insurance adjustors, examiners, and investigators	78	30	93	43	99	53
Keypunch operators	32	268	11	254	5	237
Miscellaneous clerical workers	159	288	190	526	173	575
Office machine operators, n.e.c.	17	35	30	42	41	47
Payroll and timekeeping clerks	54	121	57	166	54	184
Real estate appraisers	23	1	32	2	35	3
Secretaries, legal, medical and other	65	2,720	70	3,971	67	4,719
Shipping and receiving clerks	375	63	397	103	384	120
Statistical clerks	103	188	117	233	105	270
Stenographers	8	120	8	88	8	70
Stock clerks and storekeepers	385	111	441	185	448	222
Tabulating machine operators	4	5	1	3	1	2
Typists	56	917	82	1,182	95	1,305
Craftsmen and kindred workers	7,923	306	9,326	471	10,069	568
Air conditioning, heating and refrigeration mechanics	129	1	212	3	260	5
Aircraft mechanics and repairers	116	4	153	7	180	10
Auto body repairers	157	2	172	4	182	5
Auto mechanics	825	12	952	23	1,020	30
Brickmasons and stonemasons	170	2	201	4	230	5
Bulldozer operators	99	1	118	3	146	4

Table C-6 (Continued)

Occupation	Employment					
	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Cabinetmakers	71	4	77	6	76	7
Carpenters	972	13	1,100	25	1,168	32
Carpenter apprentices	8	1/	11	1/	12	1/
Crane, derrick and hoist operators	168	2	189	4	194	5
Data processing machine repairers	35	1	71	2	91	2
Decorators and window dressers	29	41	31	65	28	74
Electricians	442	8	566	16	629	21
Electric power line and cable workers	99	1	112	1	119	1
Excavating, grading, and road machine operators	277	3	340	6	412	8
Farm implement mechanics and repairers	46	1/	49	1	51	1
Foremen	1,265	110	1,417	145	1,508	167
Heavy equipment mechanics, including diesel	674	13	853	23	906	28
Job and die setters, metal	98	2	130	5	140	6
Machinists	350	11	381	19	439	26
Machinist apprentices	10	1/	11	1/	11	1/
Miscellaneous mechanics and repairers	152	7	183	7	191	6
Painter apprentices	2	-0-	2	1/	2	1/
Painters, construction and maintenance	385	15	413	22	420	25
Paperhangers	9	1	12	2	13	2
Pattern and model makers, except paper	40	2	38	3	35	4
Photoengravers and lithographers	29	4	39	7	42	8
Plumbers and pipefitters	351	4	452	8	490	10
Printing press apprentices	3	1/	4	1/	4	1/
Printing press operators	128	11	152	13	151	19
Printing trades apprentices, except print pressmen	6	1/	4	1/	3	1/
Radio and T.V. repairers	132	5	143	7	159	9
Sheetmetal apprentices	6	-0-	8	1/	9	1/
Sheetmetal workers and tinsmiths	152	3	157	5	157	6
Structural metal craftsmen	78	1	99	1	111	1
Telephone installers and repairers	270	10	323	16	329	19

Table C-6 (Continued)

Occupation	Employment 1970 Male	 Female	 1980 Male	 Female	 1985 Male	 Female
Telephone linemen and splicers	51	1	53	1/	54	-0-
Tilesetters	32	1/	35	1	37	1
Upholsterers	57	11	65	16	65	18
Operatives	4,726	2,163	5,429	2,600	5,593	2,725
Assemblers	484	460	519	549	520	580
Bus drivers	164	65	169	188	156	159
Checkers, examiners, and inspectors, manufacturing	359	331	407	404	409	421
Cutting operatives, n.e.c.	177	62	201	87	200	97
Delivery and route workers	792	25	936	29	978	30
Dressmakers and seamstresses, except factory	5	105	6	101	6	98
Drill press operatives	60	16	68	19	69	22
Graders and sorters, manufacturing	16	29	20	31	21	30
Grinding machine operatives	136	9	168	13	177	15
Lathe and milling machine operatives	147	8	170	12	176	13
Painters, manufactured articles	152	26	159	31	163	34
Other precision machine operatives	68	8	88	12	94	14
Punch and stamping press operatives	126	54	147	67	151	71
Sawyers	110	10	127	17	125	20
Sewers and stitchers	57	869	67	979	68	980
Solderers	7	35	3	27	1	23
Truck drivers	1,357	21	1,534	47	1,565	62
Welders and flame cutters	507	31	641	48	712	58
Service workers	1,430	2,924	1,787	4,137	1,941	4,745
Bartenders	149	40	152	69	150	85
Cooks, except private household	305	516	369	581	396	604
Childcare workers, except private household	23	316	48	435	63	485
Crossing guards and bridge tenders	19	27	12	40	9	45
Firefighters	179	2	253	5	308	7
Food service workers, n.e.c., except private household	94	295	87	396	62	450
Hairdressers and cosmetologists	48	432	50	550	50	611

Table C-6 (Continued)

Occupation	Employment 1970 Male	1970 Female	1980 Male	1980 Female	1985 Male	1985 Female
Health aides, except nursing	21	112	48	202	58	222
Housekeepers, except private household	30	81	46	115	52	127
Marshals and constables	6	1/	8	1/	9	1/
Nursing aides, orderlies and attendants	128	706	150	1,053	151	1,209
Police and detectives	374	14	495	25	556	32
Practical nurses	14	356	17	624	18	817
School monitors	2	24	2	38	2	48
Sheriffs and bailiffs	38	2	50	4	57	4
Laborers, except farm	635	18	605	25	597	28
Carpenter helpers	114	2	78	3	67	3
Gardeners and groundskeepers, except farm	521	16	528	22	530	25
Farm occupations	2,451	200	1,540	141	1,223	116
Farm foremen	29	2	24	2	23	2
Farm managers	32	1	43	2	43	3
Farm laborers, wage workers	779	118	450	86	331	70
Farmers, owners and tenants	1,611	79	1,023	51	826	41
Total, All Occupations Studied	27,815	15,585	32,767	20,946	34,045	23,191
Total, All U.S. Occupations	48,984	29,642	58,594	37,223	61,902	39,588
Occupations Studied as a Percent of All U.S. Occupations	57%	53%	56%	56%	55%	59%

1/ Less than 500 persons employed.

Note: Details may not add to totals due to rounding.

Sources: U.S. Department of Labor; 1970 Census of Population; The Conference Board.

Table C-7

Projected Change in Employment, Distributed by Sex, and Representation Shift for Women, 1970-1985, Occupations Included in Study

(in thousands)

Occupation	Change in Employment, 1970 to 1985		Representation Shift for Women,1/ 1970 to 1985
	Male	Female	
Professional, technical, and kindred workers	1,004	627	26
Computer programmers	100	14	-12
Designers	32	26	12
Drafters	187	32	19
Electrical and electronic engineering technicians	149	14	5
Engineering and science technicians, n.e.c.	255	81	22
Mechanical engineering technicians	5	1	1
Other technicians, except health	49	9	3
Personnel and labor relations workers	195	69	-14
Recreation workers	37	8	-10
Registered nurses	10	310	-2
Therapists	34	62	1
Tool programmers, numerical control	1	5	1
Managers and administrators, except farm	1,886	271	-68
Bank officials and financial managers	166	82	39
Buyers and shippers, farm products	-5	-0-	-0-
Buyers, wholesale, and retail	62	9	-21
Managers and administrators, n.e.c.	1,451	84	-94
Managers and superintendents, building	51	22	-8
Restaurant, cafeteria, and bar managers	23	59	11
Sales managers and department heads, retail	138	15	5
Salesworkers	729	771	221
Insurance agents, brokers, and underwriters	118	46	25
Real estate agents and brokers	34	100	57
Sales representatives, manufacturing	104	-5	-14

Table C-7 (Continued)

Occupation	Change in Employment, 1970 to 1985 Male	Change in Employment, 1970 to 1985 Female	Representation Shift for Women,1/ 1970 to 1985
Sales representatives, wholesale	160	42	29
Salesclerks, retail trade	158	477	65
Salesworkers, retail trade	84	32	17
Salespeople, service and construction	29	69	36
Stock and bond sales agents	41	10	6
Clerical and kindred workers	350	3,370	307
Billing clerks	17	80	1
Bookkeepers	102	258	-38
Bookkeeping and billing machine operators	2	23	-0-
Calculating machine operators	4	-1	-4
Computer and peripheral equipment operators	74	65	25
Insurance adjustors, examiners, and investigators	21	23	16
Keypunch operators	-27	-31	21
Miscellaneous clerical workers	14	287	93
Office machine operators, n.e.c.	24	12	-13
Payroll and timekeeping clerks	-0-	63	27
Real estate appraisers	12	2	2
Secretaries, legal, medical and other	2	1,999	45
Shipping and receiving clerks	9	57	48
Statistical clerks	2	82	28
Stenographers	-0-	-50	-3
Stock clerks and storekeepers	63	111	72
Tabulating machine operators	-3	-3	1
Typists	39	388	-14
Craftsmen and kindred workers	2,146	262	177
Air conditioning, heating, and refrigeration mechanics	131	4	3
Aircraft mechanics and repairers	64	6	4
Auto body repairers	25	3	3
Auto mechanics	195	18	5
Brickmasons and stonemasons	60	3	2

Table C-7 (Continued)

Occupation	Change in Employment, 1970 to 1985		Representation Shift for Women,1/ 1970 to 1985
	Male	Female	
Bulldozer operators	47	3	2
Cabinetmakers	5	3	3
Carpenters	196	19	17
Carpenter apprentices	4	-0-	-0-
Crane, derrick and hoist operators	26	3	2
Data processing machine repairers	56	1	-0-
Decorators and window dressers	-1	33	14
Electricians	187	13	10
Electric power line and cable workers	20	-0-	-1
Excavating, grading, and road machine operators	135	5	4
Farm implement mechanics and repairers	5	1	8
Foremen	243	57	34
Heavy equipment mechanics, including diesel	232	15	10
Job and die setters, metal	42	4	2
Machinists	89	15	12
Machinist apprentices	1	-0-	-0-
Miscellaneous mechanics and repairers	39	-1	-2
Painter apprentices	-0-	-0-	-0-
Painters, construction and maintenance	35	10	9
Paperhangers	4	1	1
Pattern and model makers, except paper	-5	2	2
Photoengravers and lithographers	13	4	2
Plumbers and pipefitters	139	6	6
Printing press apprentices	1	-0-	-0-
Printing press operators	23	8	6
Printing trades apprentices, except print pressmen	-3	-0-	-0-
Radio and T.V. repairers	27	4	5
Sheetmetal apprentices	3	-0-	-0-
Sheetmetal workers and tinsmiths	5	6	2
Structural metal craftsmen	33	-0-	-0-

Table C-7 (Continued)

Occupation	Change in Employment, 1970 to 1985		Representation Shift for Women,1/ 1970 to 1985
	Male	Female	
Telephone installers and repairers	59	9	7
Telephone linemen and splicers	3	-0-	-0-
Tilesetters	5	1	1
Upholsterers	8	7	4
Operatives	867	562	231
Assemblers	36	120	44
Bus drivers	-8	94	70
Checkers, examiners, and inspectors, manufacturing	50	90	22
Cutting operatives, n.e.c.	23	35	20
Delivery and route workers	186	5	-1
Dressmakers and seamstresses, except factory	1	-7	-2
Drill press operatives	9	6	2
Graders and sorters, manufacturing	5	1	-3
Grinding machine operatives	41	6	3
Lathe and milling machine operatives	29	5	3
Painters, manufactured articles	11	8	5
Other precision machine operatives	26	6	6
Punch and stamping press operatives	25	17	3
Sawyers	15	10	8
Sewers and stitchers	11	111	-3
Solderers	-6	-12	3
Truck drivers	208	41	37
Welders and flame cutters	205	27	14
Service workers	511	1,821	157
Bartenders	1	45	35
Cooks, except private household	91	88	-24
Childcare workers, except private household	40	167	-26
Crossing guards and bridge tenders	-10	18	13
Firefighters	129	5	3
Food service workers, n.e.c., except private household	-32	155	61

Table C-7 (Continued)

Occupation	Change in Employment, 1970 to 1985		Representation Shift for Women,1/ 1970 to 1985
	Male	Female	
Hairdressers and cosmetologists	2	179	16
Health aides, except nursing	37	110	-13
Housekeepers, except private household	22	46	-0-
Marshals and constables	3	-0-	-0-
Nursing aides, orderlies and attendants	23	503	58
Police and detectives	182	18	10
Practical nurses	4	461	13
School monitors	-0-	24	2
Sheriffs and bailiffs	19	2	9
Laborers, except farm	-38	10	11
Carpenter helpers	-47	1	3
Gardeners and groundskeepers, except farm	9	9	8
Farm occupations	-1,228	-84	18
Farm foremen	-6	-0-	1
Farm managers	11	2	-0-
Farm laborers, wage workers	-448	-48	17
Farmers, owners and tenants	-785	-38	-0-
Total, All Occupations Studied	6,230	7,606	1,081
Total, All U.S. Occupations	12,942	9,921	N.A.
Occupations Studied as a Percent of All U.S. Occupations	48%	77%	N.A.

1/ The representation shift for women is the estimated change in employment of women resulting from a change in the proportion of women in the occupation.

Note: Details may not add to totals due to rounding.

Sources: U.S. Department of Labor; 1970 Census of Population; The Conference Board.

Table C-8

Percent Distribution of Employment by Sex, All Ages,
1970 and Projected 1980 and 1985, Occupations Included in Study

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Professional, technical, and kindred workers	54.3%	45.7%	54.7%	45.3%	57.4%	42.6%
Computer programmers	77.3	22.7	80.0	20.0	81.3	18.7
Designers	76.5	23.5	72.0	28.0	69.7	30.3
Drafters	92.0	8.0	89.5	10.5	88.2	11.8
Electrical and electronic engineering technicians	94.3	5.7	93.3	6.7	92.8	7.2
Engineering and science technicians, n.e.c.	82.3	17.7	79.6	20.4	78.2	21.8
Mechanical engineering technicians	97.1	2.9	94.2	5.8	92.7	7.3
Other technicians, except health	89.2	10.8	87.0	13.0	85.9	14.1
Personnel and labor relations workers	68.8	31.2	70.5	29.5	71.3	28.7
Recreation workers	59.6	40.4	66.5	33.5	69.0	31.0
Registered nurses	2.6	97.4	2.7	97.3	2.8	97.2
Therapists	36.4	63.6	36.0	64.0	35.8	64.2
Tool programmers, numerical control	84.9	15.1	69.8	30.2	62.3	37.7
Managers and administrators, except farm	84.7	15.3	86.2	13.8	85.4	14.6
Bank officials and financial managers	82.6	17.4	78.6	21.4	76.5	23.5
Buyers and shippers, farm products	97.9	2.1	96.9	3.1	96.4	3.6
Buyers, wholesale, and retail trade	70.6	29.4	76.7	23.3	79.7	20.3
Managers and administrators, n.e.c.	88.4	11.6	89.5	10.5	89.0	11.0
Managers and superintendents, building	59.3	40.7	62.2	37.8	63.7	36.3
Restaurant, cafeteria, and bar managers	66.2	33.8	64.9	35.1	64.2	35.8
Sales managers and department heads, retail	75.9	24.1	75.2	24.8	74.8	25.2
Salesworkers	61.8	38.2	59.4	40.6	58.6	41.4
Insurance agents, brokers, and underwriters	87.5	12.5	84.6	15.4	83.1	16.9
Real estate agents and brokers	67.7	32.3	68.2	31.8	55.1	44.9
Sales representatives, manufacturing	91.5	8.5	93.4	6.6	94.3	5.7
Sales representatives, wholesale	93.6	6.4	91.3	8.7	90.1	9.9
Salesclerks, retail trade	35.2	64.8	33.7	66.3	32.9	67.1

Table C-8 (Continued)

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Salesworkers, retail trade	87.2%	12.8%	85.1%	14.9%	84.0%	16.0%
Salespeople, service and construction	65.9	34.1	55.7	44.3	51.4	48.6
Stock and bond sales agents	91.4	8.6	88.8	11.2	87.5	12.5
Clerical and kindred workers	21.8	78.2	19.5	80.5	17.9	82.1
Billing clerks	18.4	81.6	18.1	81.9	18.0	82.0
Bookkeepers	17.9	82.1	19.2	80.8	19.9	80.1
Bookkeeping and billing machine operators	10.4	89.6	10.2	89.8	10.1	89.9
Calculating machine operators	9.2	90.8	16.4	83.6	19.7	80.3
Computer and peripheral equipment operators	70.8	29.2	65.0	35.0	62.1	37.9
Insurance adjustors, examiners, and investigators	74.4	25.6	68.2	31.8	65.1	34.9
Keypunch operators	10.6	89.4	4.1	95.9	2.0	98.0
Miscellaneous clerical workers	35.5	64.5	26.5	73.5	23.1	76.9
Office machine operators, n.e.c.	32.5	67.5	42.0	58.0	46.7	53.3
Payroll and timekeeping clerks	31.0	69.0	25.6	74.4	22.9	77.1
Real estate appraisers	95.9	4.1	94.8	5.2	91.3	8.7
Secretaries, legal, medical and other	2.4	97.6	1.7	98.3	1.4	98.6
Shipping and receiving clerks	85.7	14.3	79.4	20.6	76.2	23.8
Statistical clerks	35.5	64.5	30.5	69.5	28.0	72.0
Stenographers	6.6	93.4	8.8	91.2	9.9	90.1
Stock clerks and storekeepers	77.6	22.4	70.4	29.6	66.8	33.2
Tabulating machine operators	48.1	51.9	31.8	68.2	26.7	73.3
Typists	5.8	94.2	6.5	93.5	6.8	93.2
Craftsmen and kindred workers	96.3	3.7	95.2	4.8	94.7	5.3
Air conditioning, heating and refrigeration mechanics	99.1	0.9	98.5	1.5	98.2	1.8
Aircraft mechanics and repairers	97.0	3.0	95.5	4.5	94.7	5.3
Auto body repairers	99.0	1.0	98.0	2.0	97.5	2.5
Auto mechanics	98.6	1.4	97.6	2.4	97.1	2.9
Brickmasons and stonemasons	98.8	1.2	98.1	1.9	97.8	2.2
Bulldozer operators	98.6	1.4	97.7	2.3	97.2	2.8
Cabinetmakers	95.1	4.9	92.6	7.4	91.5	8.5
Carpenters	98.7	1.3	97.8	2.2	97.3	2.7

Table C-8 (Continued)

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Carpenter apprentices	98.6%	1.4%	98.2%	1.8%	97.5%	2.5%
Crane, derrick and hoist operators	98.7	1.3	97.9	2.1	97.5	2.5
Data processing machine repairers	97.7	2.3	97.7	2.3	97.7	2.3
Decorators and window dressers	41.6	58.4	32.2	67.8	27.5	72.5
Electricians	98.3	1.7	97.3	2.7	96.8	3.2
Electric power line and cable workers	98.8	1.2	99.3	0.7	99.5	0.5
Excavating, grading, and road machine operators	99.0	1.0	98.4	1.6	98.1	1.9
Farm implement mechanics and repairers	98.9	1.1	97.8	2.2	97.3	2.7
Foremen	92.0	8.0	90.7	9.3	90.0	10.0
Heavy equipment mechanics, including diesel	98.1	1.9	97.4	2.6	97.0	3.0
Job and die setters, metal	97.5	2.5	96.5	3.5	96.0	4.0
Machinists	97.0	3.0	95.3	4.7	94.4	5.6
Machinist apprentices	97.4	2.6	96.4	3.6	96.5	3.5
Miscellaneous mechanics and repairers	95.8	4.2	96.5	3.5	96.8	3.2
Painter apprentices	98.9	1.1	98.3	1.7	98.0	2.0
Painters, construction and maintenance	96.2	3.8	94.9	5.1	94.3	5.7
Paperhangers	89.6	10.4	87.6	12.4	86.0	14.0
Pattern and model makers, except paper	95.3	4.7	92.2	7.8	90.6	9.4
Photoengravers and lithographers	87.4	12.6	85.2	14.8	84.1	15.9
Plumbers and pipefitters	99.0	1.0	98.3	1.7	97.9	2.1
Printing press apprentices	98.0	2.0	97.4	2.6	97.1	2.9
Printing press operators	92.0	8.0	89.8	10.2	88.7	11.3
Printing trades apprentices, except print pressmen	95.1	4.9	93.7	6.3	93.0	7.0
Radio and T.V. repairers	96.2	3.8	95.3	4.7	94.9	5.1
Sheetmetal apprentices	99.2	0.8	99.1	0.9	99.0	1.0
Sheetmetal workers and tinsmiths	97.9	2.1	96.9	3.1	96.4	3.6
Structural metal craftsmen	98.8	1.2	99.1	0.9	99.2	0.8
Telephone installers and repairers	96.6	3.4	95.2	4.8	94.5	5.5
Telephone linemen and splicers	98.7	1.3	99.2	0.8	99.4	0.6
Tilesetters	98.7	1.3	97.4	2.6	96.8	3.2
Upholsterers	83.7	16.3	80.2	19.8	78.4	21.6

Table C-8 (Continued)

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Operatives	68.6%	31.4%	67.6%	32.4%	67.3%	32.7%
Assemblers	51.3	48.7	48.6	51.4	47.3	52.7
Bus drivers	71.7	28.3	57.0	43.0	49.6	50.4
Checkers, examiners, and inspectors, manufacturing	52.0	48.0	50.2	49.8	49.3	50.7
Cutting operatives, n.e.c.	74.2	25.8	69.8	30.2	67.4	32.6
Delivery and route workers	96.9	3.1	97.0	3.0	97.0	3.0
Dressmakers and seamstresses, except factory	4.3	95.7	5.3	94.7	5.8	94.2
Drill press operatives	78.5	21.5	77.8	22.2	76.0	24.0
Graders and sorters, manufacturing	35.6	64.4	39.0	61.0	40.7	59.3
Grinding machine operatives	94.0	6.0	92.9	7.1	92.3	7.7
Lathe and milling machine operatives	94.7	5.3	93.6	6.4	93.0	7.0
Painters, manufactured articles	85.5	14.5	83.8	16.2	82.9	17.1
Other precision machine operatives	89.4	10.6	87.6	12.4	86.7	13.3
Punch and stamping press operatives	70.0	30.0	68.7	31.3	68.0	32.0
Sawyers	92.1	7.9	88.4	11.6	86.5	13.5
Sewers and stitchers	6.2	93.8	6.4	93.6	6.5	93.5
Solderers	17.2	82.8	8.8	91.2	4.6	95.4
Truck drivers	98.5	1.5	97.0	3.0	96.2	3.8
Welders and flame cutters	94.3	5.7	93.1	6.9	92.5	7.5
Service workers	32.8	67.2	30.2	69.8	29.0	71.0
Bartenders	78.7	21.3	68.7	31.3	63.7	36.3
Cooks, except private household	37.2	62.8	38.8	61.2	39.6	60.4
Childcare workers, except private household	6.8	93.2	10.0	90.0	11.6	88.4
Crossing guards and bridge tenders	40.6	59.4	24.1	75.9	15.9	84.1
Firefighers	98.8	1.2	98.1	1.9	97.8	2.2
Food service workers, n.e.c., except private household	24.1	75.9	18.1	81.9	12.1	87.9
Hairdressers and cosmetologists	10.0	90.0	8.4	91.6	7.6	92.4
Health aides, except nursing	16.1	83.9	19.2	80.8	20.8	79.2
Housekeepers, except private household	27.3	72.7	28.6	71.4	29.3	70.7
Marshals and constables	95.9	4.1	95.6	4.4	95.5	4.5
Nursing aides, orderlies and attendants	15.4	84.6	12.5	87.5	11.1	88.9

Table C-8 (Continued)

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Police and detectives	96.3%	3.7%	95.2%	5.2%	94.5%	5.4%
Practical nurses	3.7	96.3	2.7	97.3	2.2	97.8
School monitors	8.8	91.2	5.5	94.5	4.2	95.8
Sheriffs and bailiffs	94.1	5.9	93.2	6.8	92.7	7.3
Laborers, except farm	97.2	2.8	96.0	4.0	95.5	4.5
Carpenter helpers	97.9	2.1	97.8	2.2	96.1	3.9
Gardeners and groundskeepers, except farm	97.0	3.0	96.0	4.0	95.5	4.5
Farm occupations	92.5	7.5	91.6	8.4	91.3	8.7
Farm foremen	93.8	6.2	91.7	8.3	90.6	9.4
Farm managers	96.0	4.0	94.9	5.1	94.3	5.7
Farm laborers, wage workers	86.8	13.2	84.0	16.0	82.6	17.4
Farmers, owners and tenants	95.3	4.7	95.3	4.7	95.3	4.7
Total, All Occupations Studied	64.1	35.9	61.0	39.0	59.5	40.5
Total, All U.S. Occupations	62.3	37.7	62.1	38.8	61.0	39.0

Sources: U.S. Department of Labor; 1960 and 1970 Census of Population; The Conference Board.

Table C-9

Percent Distribution of Employment by Sex, 16-34 Year Olds, 1970 and Projected 1980 and 1985, Occupations Included in Study

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Professional, technical, and kindred workers						
Computer programmers	76.6%	23.4%	79.4%	20.6%	80.8%	19.2%
Designers	74.4	25.6	63.1	36.9	57.2	42.8
Drafters	92.6	7.4	89.4	10.6	87.6	12.4
Electrical and electronic engineering technicians	95.6	4.4	93.9	6.1	97.9	7.1
Engineering and science technicians, n.e.c.	96.0	4.0	74.6	25.4	90.2	9.8
Mechanical engineering technicians	96.8	3.2	92.1	7.9	92.7	7.3
Other technicians, except health	95.6	4.4	84.3	15.7	92.9	7.1
Personnel and labor relations workers	68.0	32.0	67.1	32.9	66.7	33.3
Recreation workers	62.9	33.1	74.3	25.7	78.3	21.7
Registered nurses	2.8	97.2	3.3	16.7	3.6	96.4
Therapists	36.9	63.1	44.0	56.0	47.5	52.5
Tool programmers, numerical control	83.3	16.7	67.2	32.8	59.4	40.6
Managers and administrators, except farm						
Bank officials and financial managers	83.6	16.4	75.2	24.8	71.0	29.0
Buyers and shippers, farm products	94.0	6.0	85.2	14.8	79.7	20.3
Buyers, wholesale, and retail trade	71.4	28.6	59.6	40.4	59.6	40.4
Managers and administrators, n.e.c.	89.7	10.3	89.4	10.6	89.4	10.6
Managers and superintendents, building	61.3	38.7	63.8	36.2	65.1	34.9
Restaurant, cafeteria, and bar managers	81.0	19.0	80.0	20.0	79.5	20.5
Sales managers and department heads, retail	82.8	17.2	73.7	26.3	85.9	14.1
Salesworkers						
Insurance agents, brokers, and underwriters	86.8	13.2	81.3	18.7	78.3	21.7
Real estate agents and brokers	77.6	22.4	71.4	28.6	68.1	31.9
Sales representatives, manufacturing	91.2	8.8	92.9	7.1	93.8	6.2
Sales representatives, wholesale	93.1	6.9	88.8	4.2	86.4	13.6
Salesclerks, retail trade	42.6	57.4	46.5	53.5	43.1	56.9

Table C-9 (Continued)

Occupation	1970 Male	1970 Female	1980 Male	1980 Female	1985 Male	1985 Female
Salesworkers, retail trade	88.3%	11.7%	86.3%	16.4%	81.4%	18.6%
Salespeople, service and construction	60.5	39.5	44.2	55.8	36.4	63.6
Stock and bond sales agents	91.6	8.4	84.5	15.5	80.4	19.6
Clerical and kindred workers						
Billing clerks	18.9	81.1	12.4	87.6	8.5	91.5
Bookkeepers	19.6	80.4	21.8	78.2	22.9	77.1
Bookkeeping and billing machine operators	10.5	89.5	11.1	88.9	11.4	88.6
Calculating machine operators	15.6	84.4	18.6	81.4	17.2	82.8
Computer and peripheral equipment operators	75.4	24.6	83.9	16.1	89.5	10.4
Insurance adjustors, examiners, and investigators	68.5	31.5	53.9	46.1	44.0	56.0
Keypunch operators	9.9	90.1	3.8	96.2	1.5	98.5
Miscellaneous clerical workers	32.9	67.1	21.4	78.6	15.8	84.2
Office machine operators, n.e.c.	39.9	60.1	53.2	46.8	59.5	40.5
Payroll and timekeeping clerks	30.3	69.7	22.7	77.3	19.0	81.0
Real estate appraisers	94.2	5.8	88.6	11.4	86.0	14.0
Secretaries, legal, medical and other	1.6	98.4	1.3	98.7	1.2	98.9
Shipping and receiving clerks	87.9	12.1	82.0	18.0	78.9	21.1
Statistical clerks	33.0	67.0	27.2	72.8	24.3	75.7
Stenographers	2.0	98.0	0.5	99.5	0.5	99.5
Stock clerks and storekeepers	81.5	18.5	74.1	25.9	70.3	29.7
Tabulating machine operators	54.5	45.5	27.4	72.6	14.4	85.6
Typists	5.9	94.1	6.5	93.5	6.8	93.2
Craftsmen and kindred workers						
Air conditioning, heating and refrigeration mechanics	98.7	1.3	97.8	2.2	97.4	2.6
Aircraft mechanics and repairers	97.4	2.6	95.2	4.8	94.1	5.9
Auto body repairers	99.1	0.9	98.0	2.0	97.4	2.6
Auto mechanics	98.6	1.4	97.6	2.4	97.1	2.9
Brickmasons and stonemasons	98.3	1.7	96.1	3.9	94.7	5.3
Bulldozer operators	98.9	1.1	95.4	4.6	92.9	7.1
Cabinetmakers	93.0	7.0	84.1	15.9	78.8	21.2
Carpenters	98.4	1.6	98.4	1.6	98.7	1.3

Table C-9 (Continued)

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Carpenter apprentices	99.3%	0.7%	98.6%	1.4%	98.2%	1.8%
Crane, derrick and hoist operators	98.7	1.3	97.9	2.1	97.5	2.5
Data processing machine repairers	88.6	11.4	98.4	1.6	82.0	18.0
Decorators and window dressers	49.7	50.3	40.9	59.1	36.1	63.9
Electricians	98.1	1.9	96.7	3.3	95.9	4.1
Electric power line and cable workers	98.8	1.2	99.2	0.8	99.4	0.6
Excavating, grading, and road machine operators	98.8	1.2	97.8	2.2	97.3	2.7
Farm implement mechanics and repairers	98.6	1.4	97.2	2.8	96.5	3.5
Foremen	92.6	7.4	91.7	8.3	91.3	8.7
Heavy equipment mechanics, including diesel	97.9	2.1	97.1	2.9	96.7	3.3
Job and die setters, metal	97.5	2.5	96.2	3.8	95.7	4.3
Machinists	96.6	3.4	95.1	4.9	94.5	5.5
Machinist apprentices	97.7	2.3	96.7	3.3	96.3	3.7
Miscellaneous mechanics and repairers	96.8	3.2	97.3	2.7	97.6	2.4
Painter apprentices	98.8	1.2	98.3	1.7	98.1	1.9
Painters, construction and maintenance	95.7	4.3	94.0	6.0	93.3	6.7
Paperhangers	95.6	4.4	93.5	6.5	92.4	7.6
Pattern and model makers, except paper	95.4	4.6	96.8	3.2	96.1	3.9
Photoengravers and lithographers	85.3	14.7	84.2	15.8	83.0	17.0
Plumbers and pipefitters	99.0	1.0	98.3	1.7	97.9	2.1
Printing press apprentices	99.3	0.7	99.1	0.7	99.3	0.7
Printing press operators	93.0	7.0	91.1	8.9	90.1	9.9
Printing trades apprentices, except print pressmen	95.2	4.8	93.9	6.1	93.3	6.7
Radio and T.V. repairers	96.8	3.2	94.2	5.8	92.7	7.3
Sheetmetal apprentices	99.2	0.8	99.2	0.8	99.2	0.8
Sheetmetal workers and tinsmiths	98.1	1.9	96.1	3.9	94.8	5.2
Structural metal craftsmen	99.1	0.9	99.5	0.5	99.6	0.4
Telephone installers and repairers	97.0	3.0	94.9	5.1	93.7	6.3
Telephone linemen and splicers	98.8	1.2	99.1	0.9	99.3	0.7
Tilesetters	98.5	1.5	97.0	3.0	96.3	3.7
Upholsterers	84.6	15.4	76.2	23.8	71.5	28.4

Table C-9 (Continued)

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Operatives						
Assemblers	58.2%	41.8%	55.0%	45.0%	53.4%	46.6%
Bus drivers	68.2	31.8	50.5	49.5	42.0	58.0
Checkers, examiners, and inspectors, manufacturing	56.5	43.5	51.6	48.4	49.2	50.8
Cutting operatives, n.e.c.	77.2	22.8	71.7	28.3	68.9	31.1
Delivery and route workers	97.1	2.9	96.6	3.4	96.4	3.6
Dressmakers and seamstresses, except factory	8.5	91.5	10.2	89.8	11.0	89.0
Drill press operatives	84.7	15.3	82.3	17.7	81.1	18.9
Graders and sorters, manufacturing	44.2	55.8	47.8	52.2	49.6	50.4
Grinding machine operatives	94.2	5.8	90.7	9.1	89.2	10.8
Lathe and milling machine operatives	95.5	4.5	94.6	5.4	94.2	5.8
Painters, manufactured articles	85.7	14.3	83.0	17.0	81.6	18.4
Other precision machine operatives	90.4	9.6	80.3	19.7	74.3	25.7
Punch and stamping press operatives	76.5	23.5	75.4	24.6	74.8	25.2
Sawyers	91.5	8.5	85.7	14.3	82.9	17.1
Sewers and stitchers	7.0	93.0	7.1	92.9	7.1	92.9
Solderers	19.2	80.8	9.9	90.1	5.2	94.8
Truck drivers	98.4	1.6	96.8	3.2	96.0	4.0
Welders and flame cutters	94.3	5.7	94.9	5.1	95.4	4.6
Service workers						
Bartenders	75.0	25.0	61.7	38.3	55.1	44.9
Cooks, except private household	62.3	37.7	71.0	29.0	75.3	24.7
Childcare workers, except private household	7.8	92.2	11.4	88.6	13.2	86.8
Crossing guards and bridge tenders	24.3	75.7	15.9	84.1	11.2	88.8
Firefighters	98.8	1.2	97.8	2.2	97.3	2.7
Food service workers, n.e.c., except private household	40.5	59.5	32.1	67.9	22.6	77.4
Hairdressers and cosmetologists	9.4	90.6	5.5	94.5	3.9	96.1
Health aides, except nursing	19.3	80.7	22.8	77.2	24.5	75.5
Housekeepers, except private household	43.6	56.4	45.9	54.1	47.1	52.9
Marshals and constables	93.6	6.4	89.6	10.4	87.4	12.6
Nursing aides, orderlies and attendants	18.6	81.4	14.4	85.6	10.6	89.4

Table C-9 (Continued)

Occupation	1970		1980		1985	
	Male	Female	Male	Female	Male	Female
Police and detectives	97.1%	2.9%	96.7%	3.3%	96.2%	3.8%
Practical nurses	4.0	96.0	2.1	97.9	1.4	98.6
School monitors	21.1	78.9	7.2	92.8	7.2	92.8
Sheriffs and bailiffs	94.3	5.7	93.1	6.9	92.5	7.5
Laborers, except farm						
Carpenter helpers	99.3	0.7	96.1	3.9	98.2	1.8
Gardenders and groundskeepers, except farm	97.2	2.8	96.3	3.7	95.9	4.1
Farm occupations						
Farm foremen	94.3	5.7	90.4	9.6	87.2	12.8
Farm managers	96.8	3.2	97.6	2.4	98.3	1.7
Farm laborers, wage workers	87.5	12.5	84.8	15.2	83.4	16.6
Farmers, owners and tenants	95.5	4.5	94.4	5.6	93.9	6.1

Sources: 1970 Census of Population; The Conference Board.

Table C-10

Employment in 1970 and Projected 1980 and 1985, Distributed by Race, Occupations Included in Study (in thousands)

Occupation	Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Professional, technical, and kindred workers	1,972	145	2,929	295	3,365	380
Computer programmers	168	9	233	17	268	22
Designers	115	5	153	11	164	14
Drafters	302	14	397	28	448	37
Electrical and electronic engineering technicians	146	8	220	17	291	26
Engineering and science technicians, n.e.c.	180	10	327	28	477	48
Mechanical engineering technicians	12	1/	14	1	17	1
Other technicians, except health	34	3	70	7	85	10
Personnel and labor relations workers	268	18	440	38	502	48
Recreation workers	50	10	71	21	78	27
Registered nurses	619	61	867	113	872	128
Therapists	75	7	133	14	159	19
Tool programmers, numerical control	3	1/	4	1/	4	1/
Managers and administrators, except farm	5,584	176	7,527	302	7,579	338
Bank officials and financial managers	388	10	578	22	619	27
Buyers and shippers, farm products	25	1/	20	1/	20	1/
Buyers, wholesale, and retail trade	151	4	205	5	220	6
Managers and administrators, n.e.c.	4,222	122	5,693	213	5,644	235
Managers and superintendents, building	94	6	145	5	170	3
Restaurant, cafeteria, and bar managers	449	14	524	28	511	34
Sales managers and department heads, retail	255	20	362	29	395	33
Salesworkers	4,444	164	5,572	289	5,764	342
Insurance agents, brokers, and underwriters	397	15	497	26	544	32
Real estate agents and brokers	309	7	404	10	439	11
Sales representatives, manufacturing	387	7	463	13	477	16
Sales representatives, wholesale	622	13	787	23	809	28

Table C-10(Continued)

Occupation	Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Salesclerks, retail trade	2,087	103	2,601	181	2,616	209
Salesworkers, retail trade	396	11	479	18	501	22
Salespeople, service and construction	145	6	205	14	232	19
Stock and bond sales agents	101	2	136	4	147	6
Clerical and kindred workers	7,585	553	9,784	954	10,681	1,180
Billing clerks	116	7	178	15	200	20
Bookkeepers	1,485	55	1,745	105	1,771	129
Bookkeeping and billing machine operators	62	6	75	11	80	13
Calculating machine operators	31	3	33	4	32	5
Computer and peripheral equipment operators	136	14	215	32	247	42
Insurance adjustors, examiners, and investigators	101	4	126	7	143	9
Keypunch operators	259	41	216	49	191	51
Miscellaneous clerical workers	407	39	629	86	646	102
Office machine operators, n.e.c.	47	5	63	9	75	13
Payroll and timekeeping clerks	164	11	203	20	214	24
Real estate appraisers	24	1/	33	1	37	1
Secretaries, legal, medical and other	2,672	113	3,811	230	4,473	314
Shipping and receiving clerks	380	58	423	76	421	83
Statistical clerks	267	24	310	40	326	49
Stenographers	120	8	87	9	69	9
Stock clerks and storekeepers	439	57	551	74	588	82
Tabulating machine operators	8	1	4	1	2	1
Typists	868	105	1,079	185	1,169	231
Craftsmen and kindred workers	7,708	522	8,993	804	9,652	980
Air conditioning, heating and refrigeration mechanics	124	6	201	14	245	20
Aircraft mechanics and repairers	112	8	146	14	171	19
Auto body repairers	148	11	162	13	172	15
Auto mechanics	766	71	881	94	943	107
Brickmasons and stonemasons	140	32	158	47	176	59
Bulldozer operators	87	13	98	23	118	32

Table C-10(Continued)

Occupation	Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Cabinetmakers	71	4	82	1	82	1
Carpenters	924	61	1,045	80	1,109	91
Carpenter apprentices	8	1	10	1	11	1
Crane, derrick and hoist operators	148	22	163	30	165	34
Data processing machine repairers	35	1	68	5	90	3
Decorators and window dressers	66	4	90	6	95	7
Electricians	434	16	552	30	612	38
Electric power line and cable workers	96	4	105	8	109	11
Excavating, grading, and road machine operators	262	18	314	32	375	45
Farm implement mechanics and repairers	45	2	48	2	50	2
Foremen	1,312	63	1,448	114	1,529	146
Heavy equipment mechanics, including diesel	651	36	816	60	863	71
Job and die setters, metal	94	5	125	10	134	12
Machinists	341	20	367	33	419	45
Machinist apprentices	9	1	10	1	10	2
Miscellaneous mechanics and repairers	151	7	175	15	179	18
Painter apprentices	1	1/	1	1/	2	1/
Painters, construction and maintenance	359	41	380	56	382	63
Paperhangers	9	1	13	1	14	1
Pattern and model makers, except paper	41	1	39	2	37	2
Photoengravers and lithographers	33	1	45	1	49	1
Plumbers and pipefitters	335	20	427	33	461	40
Printing press apprentices	3	1/	4	1/	4	1/
Printing press operators	130	9	153	12	157	13
Printing trades apprentices, except print pressmen	6	1/	4	1/	3	1/
Radio and T.V. repairers	129	8	140	10	155	12
Sheetmetal apprentices	6	1/	8	1/	8	1/
Sheetmetal workers and tinsmiths	149	6	154	8	153	9
Structural metal craftsmen	76	3	96	3	108	4
Telephone installers and repairers	267	13	314	25	317	31

Table C-10(Continued)

Occupation	Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Telephone linemen and splicers	49	3	48	5	48	6
Tilesetters	29	3	31	5	32	6
Upholsterers	62	6	72	9	70	13
Operatives	6,097	792	6,931	1,103	7,086	1,232
Assemblers	817	126	898	170	912	188
Bus drivers	194	35	240	58	247	68
Checkers, examiners, and inspectors, manufacturing	631	59	727	84	735	95
Cutting operatives, n.e.c.	231	8	275	14	281	16
Delivery and route workers	730	87	840	125	865	143
Dressmakers and seamstresses, except factory	97	13	90	16	86	18
Drill press operatives	70	6	80	8	82	9
Graders and sorters, manufacturing	39	6	43	8	42	9
Grinding machine operatives	132	13	161	19	170	22
Lathe and milling machine operatives	148	7	172	10	177	12
Painters, manufactured articles	151	27	155	40	157	40
Other precision machine operatives	72	5	92	8	100	9
Punch and stamping press operatives	162	18	189	25	194	28
Sawyers	99	21	120	24	121	24
Sewers and stitchers	814	112	855	190	825	223
Solderers	38	5	25	4	24	4
Truck drivers	1,189	189	1,377	204	1,423	203
Welders and flame cutters	483	55	592	96	648	122
Service workers	3,591	761	4,846	1,078	5,441	1,245
Bartenders	178	11	208	13	221	14
Cooks, except private household	638	183	762	188	814	186
Childcare workers, except private household	283	56	396	86	444	102
Crossing guards and bridge tenders	42	4	46	6	48	6
Firefighters	176	5	251	7	306	9
Food service workers, n.e.c., except private household	307	82	393	90	423	89
Hairdressers and cosmetologists	440	40	561	39	625	37

Table C-10(Continued)

Occupation	Employment 1970 White	1970 Nonwhite	1980 White	1980 Nonwhite	1985 White	1985 Nonwhite
Health aides, except nursing	105	28	195	55	217	63
Housekeepers, except private household	95	16	136	25	151	28
Marshals and constables	6	1/	8	1/	9	1/
Nursing aides, orderlies and attendants	613	221	869	335	972	388
Police and detectives	362	26	473	47	528	60
Practical nurses	283	87	461	180	581	254
School monitors	24	2	36	4	45	5
Sheriffs and bailiffs	38	2	51	3	57	4
Laborers, except farm	513	141	504	126	503	122
Carpenter helpers	90	27	66	14	59	11
Gardeners and groundskeepers, except farm	423	114	438	112	444	111
Farm occupations	2,394	257	1,573	108	1,275	64
Farm foremen	28	3	23	3	22	3
Farm managers	31	2	43	2	44	2
Farm laborers, wage workers	694	203	445	91	344	57
Farmers, owners and tenants	1,641	49	1,062	12	865	2
Total, All Occupations Studied	39,888	3,511	48,659	5,059	51,356	5,879
Total, All U.S. Occupations	70,182	8,445	84,439	11,378	88,869	12,621
Occupations Studied as a Percent of All U.S. Occupations	57%	42%	58%	45%	58%	47%

1/ Less than 500 persons employed.

Note: Details may not add to totals due to rounding.

Sources: U.S. Department of Labor; 1970 Census of Population; The Conference Board.

Table C-11

Projected Change in Employment, Distributed by Race, and Representation Shift for Nonwhites,[1/] 1970 to 1985, Occupations Included in Study (in thousands)

Occupation	Changes in Employment, 1970 to 1985		Representation Shift for Nonwhites, 1970 to 1985
	White	Nonwhite	
Professional, technical, and kindred workers	1,393	235	128
Computer programmers	100	13	6
Designers	49	9	6
Drafters	146	23	16
Electrical and electronic engineering technicians	145	18	10
Engineering and science technicians, n.e.c.	297	38	21
Mechanical engineering technicians	5	1	1
Other technicians, except health	51	7	3
Personnel and labor relations workers	234	30	13
Recreation workers	28	17	10
Registered nurses	253	67	38
Therapists	84	12	4
Tool programmers, numerical control	1	-0-	-0-
Managers and administrators, except farm	1,995	162	95
Bank officials and financial managers	231	17	11
Buyers and shippers, farm products	-5	-0-	-0-
Buyers, wholesale, and retail trade	69	2	1
Managers and administrators, n.e.c.	1,422	113	71
Managers and superintendents, building	76	-3	-7
Restaurant, cafeteria, and bar managers	62	20	17
Sales managers and department heads, retail	140	13	2
Salesworkers	1,320	178	126
Insurance agents, brokers, and underwriters	147	17	12
Real estate agents and brokers	130	4	1
Sales representatives, manufacturing	90	9	7

Table C-11 (Continued)

Occupation	Changes in Employment, 1970 to 1985 White	Changes in Employment, 1970 to 1985 Nonwhite	Representation Shift for Nonwhites, 1970 to 1985
Sales representatives, wholesale	187	15	12
Salesclerks, retail trade	529	106	76
Salesworkers, retail trade	105	11	8
Salespeople, service and construction	87	13	8
Stock and bond sales agents	46	4	2
Clerical and kindred workers	3,096	627	401
Billing clerks	84	13	7
Bookkeepers	286	74	61
Bookkeeping and billing machine operators	18	7	5
Calculating machine operators	1	2	2
Computer and peripheral equipment operators	111	28	15
Insurance adjustors, examiners, and investigators	42	5	3
Keypunch operators	-68	10	18
Miscellaneous clerical workers	239	63	36
Office machine operators, n.e.c.	28	8	5
Payroll and timekeeping clerks	50	13	10
Real estate appraisers	13	-0-	-0-
Secretaries, legal, medical and other	1,801	201	117
Shipping and receiving clerks	41	25	16
Statistical clerks	59	25	17
Stenographers	-51	1	4
Stock clerks and storekeepers	149	25	5
Tabulating machine operators	-6	-0-	-0-
Typists	301	126	80
Craftsmen and kindred workers	1,949	458	314
Air conditioning, heating and refrigeration mechanics	121	14	8
Aircraft mechanics and repairers	59	11	6
Auto body repairers	24	4	3
Auto mechanics	177	36	18
Brickmasons and stonemasons	36	27	16

Table C-11 (Continued)

Occupation	Changes in Employment, 1970 to 1985		Representation Shift for Nonwhites, 1970 to 1985
	White	Nonwhite	
Bulldozer operators	31	19	13
Cabinetmakers	11	-3	-3
Carpenters	185	30	17
Carpenter apprentices	3	-0-	-0-
Crane, derrick and hoist operators	17	12	8
Data processing machine repairers	55	2	1
Decorators and window dressers	29	3	1
Electricians	178	22	15
Electric power line and cable workers	14	7	5
Excavating, grading, and road machine operators	113	27	19
Farm implement mechanics and repairers	5	-0-	-0-
Foremen	217	83	69
Heavy equipment mechanics, including diesel	212	35	22
Job and die setters, metal	40	7	4
Machinists	78	25	20
Machinist apprentices	1	1	1
Miscellaneous mechanics and repairers	28	11	9
Painter apprentices	1	-0-	-0-
Painters, construction and maintenance	23	22	17
Paperhangers	5	-0-	-0-
Pattern and model makers, except paper	-4	1	1
Photoengravers and lithographers	16	-0-	-0-
Plumbers and pipefitters	126	20	12
Printing press apprentices	1	-0-	-0-
Printing press operators	27	4	2
Printing trades apprentices, except print pressmen	-3	-0-	-0-
Radio and T.V. repairers	26	4	2
Sheetmetal apprentices	2	-0-	-0-
Sheetmetal workers and tinsmiths	4	3	3
Structural metal craftsmen	32	1	-1

Table C-11 (Continued)

Occupation	Changes in Employment, 1970 to 1985		Representation Shift for Nonwhites, 1970 to 1985
	White	Nonwhite	
Telephone installers and repairers	50	18	16
Telephone linemen and splicers	-1	3	3
Tilesetters	3	3	2
Upholsterers	12	7	5
Operatives	989	440	282
Assemblers	95	62	41
Bus drivers	53	33	20
Checkers, examiners, and inspectors, manufacturing	104	36	24
Cutting operatives, n.e.c.	50	8	6
Delivery and route workers	135	56	35
Dressmakers and seamstresses, except factory	-11	5	5
Drill press operatives	12	3	2
Graders and sorters, manufacturing	5	3	2
Grinding machine operatives	38	9	4
Lathe and milling machine operatives	29	5	4
Painters, manufactured articles	6	13	10
Other precision machine operatives	28	4	3
Punch and stamping press operatives	32	10	6
Sawyers	22	3	-1
Sewers and stitchers	11	111	96
Solderers	-14	-1	1
Truck drivers	234	14	-20
Welders and flame cutters	165	67	44
Service workers	1,850	484	56
Bartenders	43	3	1
Cooks, except private household	176	3	-37
Childcare workers, except private household	161	46	11
Crossing guards and bridge tenders	6	2	1
Firefighters	130	4	1
Food service workers, n.e.c., except private household	116	7	-18

Table C-11 (Continued)

Occupation	Changes in Employment, 1970 to 1985 White	Changes in Employment, 1970 to 1985 Nonwhite	Representation Shift for Nonwhites, 1970 to 1985
Hairdressers and cosmetologists	185	-3	-18
Health aides, except nursing	112	35	5
Housekeepers, except private household	56	12	2
Marshals and constables	3	-0-	-0-
Nursing aides, orderlies and attendants	359	167	27
Police and detectives	166	34	21
Practical nurses	298	167	58
School monitors	21	3	1
Sheriffs and bailiffs	19	2	1
Laborers, except farm	-10	-19	-12
Carpenter helpers	-31	-16	-5
Gardeners and groundskeepers, except farm	21	-3	-7
Farm occupations	-1,119	-193	-56
Farm foremen	-6	-0-	1
Farm managers	13	-0-	-0-
Farm laborers, wage workers	-350	-146	-34
Farmers, owners and tenants	-776	-47	-23
Total, All Occupations Studied	11,468	2,368	1,338
Total, All U.S. Occupations	18,687	4,176	N.A.
Occupations Studied as a Percent of All U.S. Occupations	61%	57%	N.A.

1/ The representation shift for nonwhites is the estimated change in employment of nonwhites resulting from a change in the proportion of nonwhites in the occupation.

Note: Details may not add to totals due to rounding.

Sources: U.S. Department of Labor; 1970 Census of Population; The Conference Board.

Table C-12

Percent Distribution of Employment by Race, All Ages, 1970 and Projected 1980 and 1985, Occupations Included in Study

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Professional, technical, and kindred workers	93.2%	6.8%	90.8%	9.2%	89.9%	10.1%
Computer programmers	94.5	5.5	93.2	6.8	92.5	7.5
Designers	95.6	4.4	93.4	6.6	92.3	7.7
Drafters	95.6	4.4	93.5	6.5	92.4	7.6
Electrical and electronic engineering technicians	94.8	5.2	92.8	7.2	91.8	8.2
Engineering and science technicians, n.e.c.	94.8	5.2	92.2	7.8	90.9	9.1
Mechanical engineering technicians	97.0	3.0	95.5	4.5	94.4	5.6
Other technicians, except health	92.5	7.5	90.5	9.5	89.5	10.5
Personnel and labor relations workers	93.6	6.4	92.0	8.0	91.2	8.8
Recreation workers	83.6	16.4	77.6	22.4	74.6	25.4
Registered nurses	91.0	9.0	88.5	11.5	87.2	12.8
Therapists	91.6	8.4	90.3	9.7	89.6	10.4
Tool programmers, numerical control	96.0	4.0	92.8	7.2	93.0	7.0
Managers and administrators, except farm	96.9	3.1	96.1	3.9	95.7	4.3
Bank officials and financial managers	97.5	2.5	96.4	3.6	95.8	4.2
Buyers and shippers, farm products	98.8	1.2	99.0	1.0	99.1	0.9
Buyers, wholesale, and retail trade	97.5	2.5	97.4	2.6	97.3	2.7
Managers and administrators, n.e.c.	97.2	2.8	96.4	3.6	96.0	4.0
Managers and superintendents, building	94.2	5.8	96.8	3.2	98.1	1.9
Restaurant, cafeteria, and bar managers	97.0	3.0	94.9	5.1	93.8	6.2
Sales managers and department heads, retail	92.8	7.2	92.5	7.5	92.3	7.7
Salesworkers	96.4	3.6	95.1	4.9	94.4	5.6
Insurance agents, brokers, and underwriters	96.4	3.6	95.1	4.9	94.4	5.6
Real estate agents and brokers	97.8	2.2	97.7	2.3	97.6	2.4
Sales representatives, manufacturing	98.2	1.8	97.3	2.7	96.8	3.2
Sales representatives, wholesale	98.0	2.0	97.1	2.9	96.6	3.4

Table C-12 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Salesclerks, retail trade	95.3%	4.7%	93.5%	6.5%	92.6%	7.4%
Salesworkers, retail trade	97.3	2.7	96.3	3.7	95.8	4.2
Salespeople, service and construction	95.9	4.1	93.7	6.3	92.6	7.4
Stock and bond sales agents	97.8	2.2	96.8	3.2	96.3	3.7
Clerical and kindred workers	93.2	6.8	91.1	8.9	90.1	9.9
Billing clerks	94.1	5.9	92.0	8.0	90.9	9.1
Bookkeepers	96.4	3.6	94.3	5.7	93.2	6.8
Bookkeeping and billing machine operators	90.9	9.1	87.6	12.4	86.0	14.0
Calculating machine operators	92.0	8.0	89.7	10.9	87.6	12.4
Computer and peripheral equipment operators	90.6	9.4	87.2	12.8	85.5	14.5
Insurance adjustors, examiners, and investigators	96.0	4.0	94.5	5.5	93.8	6.2
Keypunch operators	86.4	13.6	81.5	18.5	79.0	21.0
Miscellaneous clerical workers	91.2	8.8	88.0	12.0	86.4	13.6
Office machine operators, n.e.c.	90.6	9.4	87.2	12.8	85.5	14.5
Payroll and timekeeping clerks	93.8	6.2	91.1	8.9	89.8	10.2
Real estate appraisers	98.0	2.0	97.9	2.1	97.8	2.2
Secretaries, legal, medical and other	96.1	3.9	94.3	5.7	93.5	6.5
Shipping and receiving clerks	86.8	13.2	84.7	15.3	83.6	16.4
Statistical clerks	91.6	8.4	88.5	11.5	87.0	13.0
Stenographers	93.7	6.3	90.3	9.7	88.6	11.4
Stock clerks and storekeepers	88.6	11.4	88.1	11.9	87.8	12.2
Tabulating machine operators	86.5	13.5	81.6	18.4	79.2	20.8
Typists	89.2	10.8	85.4	14.6	83.5	16.5
Craftsmen and kindred workers	93.7	6.3	91.7	8.3	90.8	9.2
Air conditioning, heating, and refrigeration mechanics	95.3	4.7	93.4	6.6	92.4	7.6
Aircraft mechanics and repairers	93.5	6.5	91.3	8.7	90.2	9.8
Auto body repairers	93.3	6.7	92.4	7.6	91.9	8.1
Auto mechanics	91.5	8.5	90.4	9.6	89.8	10.2
Brickmasons and stonemasons	81.6	18.4	77.2	22.8	75.0	25.0
Bulldozer operators	87.0	13.0	81.4	18.6	78.6	21.4

Table C-12 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Cabinetmakers	95.0%	5.0%	98.8%	1.2%	98.8%	1.2%
Carpenters	93.8	6.2	92.9	7.1	92.4	7.6
Carpenter apprentices	94.2	5.8	92.8	7.2	92.1	7.9
Crane, derrick and hoist operators	87.1	12.9	84.4	15.6	83.0	17.0
Data processing machine repairers	96.9	3.1	93.6	6.4	96.3	3.7
Decorators and window dressers	93.9	6.1	93.6	6.4	93.4	6.6
Electricians	96.4	3.6	94.9	5.1	94.1	5.9
Electric power line and cable workers	95.6	4.4	92.6	7.4	91.1	8.9
Excavating, grading, and road machine operators	93.7	6.3	90.7	9.3	89.2	10.8
Farm implement mechanics and repairers	96.2	3.8	95.8	4.2	95.6	4.4
Foremen	95.4	4.6	92.7	7.3	91.3	8.7
Heavy equipment mechanics, including diesel	94.7	5.3	93.2	6.8	92.4	7.6
Job and die setters, metal	94.5	5.5	92.8	7.2	91.9	8.1
Machinists	94.4	5.6	91.7	8.3	90.3	9.7
Machinist apprentices	91.5	8.5	87.6	12.4	85.6	14.4
Miscellaneous mechanics and repairers	95.3	4.7	92.3	7.7	90.8	9.2
Painter apprentices	85.2	14.8	81.6	18.4	79.8	20.2
Painters, construction and maintenance	89.8	10.2	87.2	12.8	85.9	14.1
Paperhangers	94.5	5.5	93.0	7.0	92.2	7.8
Pattern and model makers, except paper	97.6	2.4	96.1	3.9	95.3	4.7
Photoengravers and lithographers	98.0	2.0	98.0	2.0	98.0	2.0
Plumbers and pipefitters	94.5	5.5	92.9	7.1	92.1	7.9
Printing press apprentices	95.8	4.2	94.3	5.7	93.6	6.4
Printing press operators	93.7	6.3	92.9	7.1	92.5	7.5
Printing trades apprentices, except print pressmen	95.1	4.9	93.2	6.8	92.2	7.8
Radio and T.V. repairers	93.8	6.2	93.1	6.9	92.7	7.3
Sheetmetal apprentices	95.6	4.4	95.3	4.7	95.2	4.8
Sheetmetal workers and tinsmiths	96.3	3.7	94.9	5.1	94.2	5.8
Structural metal craftsmen	95.7	4.3	96.4	3.6	96.7	3.3
Telephone installers and repairers	95.5	4.5	92.5	7.5	91.0	9.0

Table C-12 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Telephone linemen and splicers	94.5%	5.5%	90.9%	9.1%	89.1%	10.9%
Tilesetters	89.3	10.7	86.4	13.6	84.9	15.1
Upholsterers	90.8	9.2	88.8	11.2	84.8	15.2
Operatives	88.5	11.5	86.3	13.7	85.1	14.8
Assemblers	86.6	13.4	84.1	15.9	82.9	17.1
Bus drivers	84.7	15.3	80.6	19.4	78.5	21.5
Checkers, examiners, and inspectors, manufacturing	91.5	8.5	89.6	10.4	88.6	11.4
Cutting operatives, n.e.c.	96.6	3.4	95.3	4.7	94.6	5.4
Delivery and route workers	89.3	10.7	87.0	13.0	85.8	14.2
Dressmakers and seamstresses, except factory	87.8	12.2	84.6	15.4	83.0	17.0
Drill press operatives	92.0	8.0	90.7	9.3	90.0	10.0
Graders and sorters, manufacturing	86.2	13.8	84.1	15.9	83.0	17.0
Grinding machine operatives	91.0	9.0	89.5	10.5	88.7	11.3
Lathe and milling machine operatives	95.7	4.3	94.4	5.6	93.7	6.3
Painters, manufactured articles	85.1	14.9	81.6	18.4	79.8	20.2
Other precision machine operatives	93.7	6.3	92.2	7.8	91.4	8.6
Punch and stamping press operatives	90.0	10.0	88.3	11.7	87.4	12.6
Sawyers	82.6	17.4	83.3	16.7	83.6	16.4
Sewers and stitchers	87.9	12.1	81.8	18.2	78.7	21.3
Solderers	89.2	10.8	85.2	14.8	83.2	16.8
Truck drivers	86.3	13.7	87.1	12.9	87.5	12.5
Welders and flame cutters	89.8	10.2	86.0	14.0	84.1	15.9
Service workers	82.5	17.5	81.8	18.2	81.4	18.6
Bartenders	94.2	5.8	94.0	6.0	93.9	6.1
Cooks, except private household	77.7	22.3	80.2	19.8	81.4	18.6
Childcare workers, except private household	83.4	16.6	79.3	20.7	80.0	20.0
Crossing guards and bridge tenders	90.3	9.7	89.3	10.7	88.8	11.2
Firefighters	97.3	2.7	97.1	2.9	97.0	3.0
Food service workers, n.e.c., except private household	79.0	21.0	81.4	18.6	82.6	17.4
Hairdressers and cosmetologists	91.7	8.3	93.5	6.5	94.4	5.6

Table C-12 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Health aides, except nursing	79.2%	20.8%	78.1%	21.9%	77.5%	22.5%
Housekeepers, except private household	85.3	14.7	84.7	15.3	84.4	15.6
Marshals and constables	97.5	2.5	97.5	2.5	97.5	2.5
Nursing aides, orderlies and attendants	73.5	26.5	72.2	27.8	71.5	28.5
Police and detectives	93.4	6.6	91.0	9.0	89.8	10.2
Practical nurses	76.5	23.5	71.9	28.1	69.6	30.4
School monitors	92.0	8.0	90.7	9.3	90.0	10.0
Sheriffs and bailiffs	95.7	4.3	94.4	5.6	93.7	6.3
Laborers, except farm	78.4	21.6	80.0	20.0	80.5	19.5
Carpenter helpers	77.2	22.8	82.2	17.8	84.7	15.3
Gardeners and groundskeepers, except farm	78.8	21.2	79.6	20.4	80.0	20.0
Farm occupations	90.3	9.7	93.6	6.4	95.2	4.8
Farm foremen	90.0	10.0	87.7	12.3	86.5	13.5
Farm managers	95.4	4.6	95.6	4.4	95.7	4.3
Farm laborers, wage workers	77.4	22.6	83.0	17.0	85.8	14.3
Farmers, owners and tenants	97.1	2.9	98.9	1.1	99.8	0.2
Total, All Occupations Studied	91.9	8.1	90.6	9.4	89.7	10.3
Total, All U.S. Occupations	89.3	10.7	88.1	11.9	87.6	12.4

Table C-13

Percent Distribution of Employment by Race, 16-34 Year Olds, 1970 and Projected 1980 and 1985, Occupations Included in Study

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Professional, technical, and kindred workers						
Computer programmers	94.5%	5.5%	93.2%	6.8%	92.5%	7.5%
Designers	93.8	6.2	88.8	11.2	85.9	14.1
Drafters	94.8	5.2	91.5	8.5	89.7	10.3
Electrical and electronic engineering technicians	94.9	5.1	90.9	9.1	95.8	4.2
Engineering and science technicians, n.e.c.	94.1	5.9	90.2	9.8	88.0	12.0
Mechanical engineering technicians	95.4	4.6	90.9	9.1	89.9	10.1
Other technicians, except health	92.3	7.7	87.4	12.6	84.4	15.6
Personnel and labor relations workers	90.9	9.1	86.8	13.2	85.3	14.7
Recreation workers	81.0	19.0	70.4	29.6	64.8	35.2
Registered nurses	89.7	10.3	87.7	12.3	87.0	13.0
Therapists	90.7	9.3	90.1	9.9	89.9	10.1
Tool programmers, numerical control	95.4	4.6	90.9	9.1	90.4	9.6
Managers and administrators, except farm						
Bank officials and financial managers	96.0	4.0	93.0	7.0	91.2	8.8
Buyers and shippers, farm products	97.1	2.9	96.4	3.6	96.2	3.8
Buyers, wholesale, and retail trade	97.1	2.9	97.0	3.0	97.0	3.0
Managers and administrators, n.e.c.	96.4	3.6	94.3	5.7	93.1	6.9
Managers and superintendents, building	93.5	6.5	97.2	2.8	98.6	1.4
Restaurant, cafeteria, and bar managers	96.2	3.8	94.9	5.1	94.7	5.3
Sales managers and department heads, retail	94.3	5.7	94.8	5.2	95.1	4.9
Salesworkers						
Insurance agents, brokers, and underwriters	95.0	5.0	91.2	8.8	88.9	11.1
Real estate agents and brokers	97.7	2.3	98.5	1.5	98.9	1.1
Sales representatives, manufacturing	97.3	2.7	95.2	4.8	94.0	6.0
Sales representatives, wholesale	97.4	2.6	95.6	4.4	94.6	5.4

Table C-13 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Salesclerks, retail trade	93.4%	6.6%	90.3%	9.7%	88.6%	11.4%
Salesworkers, retail trade	96.0	4.0	94.0	6.0	92.9	7.1
Salespeople, service and construction	95.0	5.0	92.6	7.4	91.5	8.5
Stock and bond sales agents	97.0	3.0	94.7	5.3	93.3	6.7
Clerical and kindred workers						
Billing clerks	92.5	7.5	84.0	16.0	79.7	20.3
Bookkeepers	94.4	5.6	90.6	9.4	88.6	11.4
Bookkeeping and billing machine operators	87.7	12.3	80.1	19.9	76.6	23.4
Calculating machine operators	84.6	15.4	81.4	18.6	82.2	17.8
Computer and peripheral equipment operators	90.0	10.0	81.6	18.4	77.0	23.0
Insurance adjustors, examiners, and investigators	94.8	5.2	86.7	13.3	81.7	18.3
Keypunch operators	84.9	15.1	74.7	25.3	69.1	30.9
Miscellaneous clerical workers	91.2	8.8	80.5	19.5	74.0	26.0
Office machine operators, n.e.c.	89.3	10.7	79.7	20.3	74.4	25.6
Payroll and timekeeping clerks	91.6	8.4	85.1	14.9	81.6	18.4
Real estate appraisers	98.8	1.2	99.2	0.8	99.4	0.6
Secretaries, legal, medical and other	94.6	5.4	91.1	8.9	89.3	10.7
Shipping and receiving clerks	85.6	14.4	85.0	15.0	84.9	15.1
Statistical clerks	88.4	11.6	80.9	19.1	77.4	22.6
Stenographers	91.0	9.0	85.1	14.9	82.0	18.0
Stock clerks and storekeepers	87.6	12.4	88.1	11.9	87.8	12.2
Tabulating machine operators	86.1	13.9	74.7	25.3	68.3	31.7
Typists	82.3	17.7	70.1	29.9	63.3	36.7
Craftsmen and kindred workers						
Air conditioning, heating and refrigeration mechanics	94.1	5.9	91.4	8.6	90.0	10.0
Aircraft mechanics and repairers	92.3	7.7	89.7	10.3	88.4	11.6
Auto body repairers	93.7	6.3	93.9	6.1	94.1	5.9
Auto mechanics	92.6	7.4	92.8	7.2	93.0	7.0
Brickmasons and stonemasons	82.0	18.0	77.1	22.9	75.3	24.7
Bulldozer operators	87.8	12.2	82.1	17.9	79.2	20.8

Table C-13 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Cabinetmakers	93.4%	6.6%	98.4%	1.6%	98.4%	1.6%
Carpenters	94.2	5.8	93.8	6.2	93.6	6.4
Carpenter apprentices	93.9	6.1	90.7	9.3	88.8	11.2
Crane, derrick and hoist operators	88.9	11.1	90.4	9.6	91.6	8.4
Data processing machine repairers	96.2	3.8	91.9	8.1	94.0	6.0
Decorators and window dressers	91.8	8.2	90.3	9.7	89.5	10.5
Electricians	95.7	4.3	93.9	6.1	93.0	7.0
Electric power line and cable workers	94.2	5.8	85.0	15.0	79.2	20.8
Excavating, grading, and road machine operators	93.1	6.9	89.5	10.5	87.6	12.4
Farm implement mechanics and repairers	96.9	3.1	97.5	2.5	97.9	2.1
Foremen	94.2	5.8	91.2	8.8	89.8	10.2
Heavy equipment mechanics, including diesel	94.3	5.7	93.8	6.2	93.7	6.3
Job and die setters, metal	93.8	6.2	90.5	9.5	88.9	11.1
Machinists	93.0	7.0	90.6	9.3	89.8	10.2
Machinist apprentices	91.4	8.6	87.1	12.9	84.9	15.1
Miscellaneous mechanics and repairers	94.8	5.2	91.5	8.5	89.9	10.1
Painter apprentices	90.0	10.0	88.4	11.6	87.7	12.3
Painters, construction and maintenance	89.5	10.5	87.8	12.2	86.7	13.3
Paperhangers	97.8	2.2	97.4	2.6	97.2	2.8
Pattern and model makers, except paper	96.7	3.3	97.0	3.0	97.8	2.2
Photoengravers and lithographers	98.8	1.2	99.4	0.6	99.7	0.3
Plumbers and pipefitters	93.9	6.1	91.5	8.5	90.2	9.8
Printing press apprentices	95.6	4.4	91.4	8.6	88.9	11.1
Printing press operators	92.5	7.5	88.6	11.4	82.1	17.9
Printing trades apprentices, except print pressmen	94.8	5.2	88.2	11.8	84.9	15.1
Radio and T.V. repairers	93.0	7.0	90.8	9.2	89.8	10.2
Sheetmetal apprentices	95.4	4.6	95.0	5.0	94.7	5.3
Sheetmetal workers and tinsmiths	95.2	4.8	[illegible]	7.8	90.5	9.5
Structural metal craftsmen	95.0	5.0	95.7	4.3	96.1	3.9
Telephone installers and repairers	93.9	6.1	87.4	12.6	83.5	16.5

Table C-13 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Telephone linemen and splicers	94.2%	5.8%	85.0%	15.0%	79.2%	20.8%
Tilesetters	88.1	11.9	86.3	13.7	85.6	14.4
Upholsterers	88.0	12.0	86.5	13.5	82.5	17.5
Operatives						
Assemblers	82.7	17.3	71.3	28.7	65.3	34.7
Bus drivers	77.3	22.7	72.8	27.2	71.0	29.0
Checkers, examiners, and inspectors, manufacturing	87.2	12.8	77.0	23.0	71.3	28.7
Cutting operatives, n.e.c.	83.2	16.8	78.0	22.0	75.6	24.4
Delivery and route workers	89.3	10.7	89.8	10.2	90.4	9.6
Dressmakers and seamstresses, except factory	81.0	19.0	81.5	18.5	82.4	17.6
Drill press operatives	90.4	9.6	88.8	11.2	88.0	12.0
Graders and sorters, manufacturing	84.8	15.2	83.5	16.5	83.0	17.0
Grinding machine operatives	90.6	9.4	90.4	9.6	90.4	9.6
Lathe and milling machine operatives	94.8	5.2	93.2	6.8	92.4	7.6
Painters, manufactured articles	85.1	14.9	83.4	16.6	82.7	17.3
Other precision machine operatives	91.5	8.5	88.6	11.4	87.4	12.6
Punch and stamping press operatives	87.6	13.4	85.6	14.4	84.6	15.4
Sawyers	82.1	17.9	83.8	16.2	84.6	15.4
Sewers and stitchers	83.7	16.3	74.1	25.9	69.2	30.8
Solderers	86.7	13.3	79.7	20.3	75.9	24.1
Truck drivers	86.8	13.2	88.2	11.8	88.9	11.1
Welders and flame cutters	87.4	12.6	80.9	19.1	77.2	22.8
Service workers						
Bartenders	93.5	6.5	95.4	4.6	96.4	3.6
Cooks, except private household	77.6	22.4	81.9	19.0	82.6	17.4
Childcare workers, except private household	80.4	19.6	79.0	21.0	78.2	21.8
Crossing guards and bridge tenders	89.1	10.9	89.3	10.7	88.8	11.2
Firefighters	97.2	2.8	97.1	2.9	97.0	3.0
Food service workers, n.e.c., except private household	75.8	24.2	86.8	13.2	79.2	20.8
Hairdressers and cosmetologists	94.3	5.7	97.9	2.1	99.0	1.0

Table C-13 (Continued)

Occupation	Percent Distribution of Employment					
	1970		1980		1985	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
Health aides, except nursing	77.8%	22.2%	82.6%	17.4%	85.2%	14.8%
Housekeepers, except private household	83.6	16.4	82.9	17.1	82.5	17.5
Marshals and constables	96.3	3.7	95.0	5.0	94.0	6.0
Nursing aides, orderlies and attendants	71.3	28.7	77.5	22.5	80.8	19.2
Police and detectives	92.6	7.4	90.7	9.3	89.8	10.2
Practical nurses	73.2	26.8	75.0	25.0	77.1	22.9
School monitors	89.4	10.6	87.7	12.3	86.8	13.2
Sheriffs and bailiffs	96.1	3.9	94.3	5.7	93.3	6.7
Laborers, except farm						
Carpenter helpers	94.2	5.8	93.8	6.2	93.6	6.4
Gardeners and groundskeepers, except farm	84.0	16.0	86.8	13.2	88.1	11.9
Farm occupations						
Farm foremen	93.3	6.7	90.9	9.1	89.6	10.4
Farm managers	96.5	3.5	96.2	3.8	96.1	3.9
Farm laborers, wage workers	82.4	17.6	88.8	11.2	91.5	8.5
Farmers, owners and tenants	98.2	1.8	99.7	0.3	100.0	0.0

Sources: 1970 Census of Population; The Conference Board.

Table C-14

Percent Distribution of Employment by Level of Educational Attainment, All Ages, 1970 and Projected 1980 and 1985, Occupations Included in Study

Occupation	Percent Distribution of Employment								
	1970			1980			1985		
	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More
Professional, technical, and kindred workers	9.9%	68.7%	21.4%	7.1%	70.1%	22.8%	5.8%	71.3%	22.9%
Computer programmers	1.6	56.7	41.7	1.4	49.2	49.4	1.3	45.4	53.3
Designers	11.2	58.6	30.2	7.4	59.3	33.3	5.5	59.6	34.9
Drafters	11.5	83.0	5.5	10.7	86.6	2.7	10.4	87.6	2.0
Electrical and electronic engineering technicians	11.5	83.0	5.5	6.7	87.2	6.1	4.3	89.3	6.4
Engineering and science technicians, n.e.c.	14.3	72.7	13.0	8.4	77.1	14.5	5.5	79.2	15.3
Mechanical engineering technicians	17.2	68.1	14.7	10.2	73.1	16.7	6.7	75.6	17.7
Other technicians, except health	12.1	72.3	15.6	7.0	75.8	17.2	4.5	77.5	18.0
Personnel and labor relations workers	8.9	52.0	39.1	8.8	54.6	36.6	5.8	55.9	35.3
Recreation workers	15.2	52.8	32.0	17.4	57.0	25.6	18.5	59.1	22.4
Registered nurses	9.6	74.5	15.9	5.4	76.4	18.2	3.3	77.3	19.4
Therapists	6.3	38.3	55.4	2.4	41.9	55.6	1.7	42.6	55.7
Tool programmers, numerical control	6.0	70.4	23.6	3.4	71.3	25.3	2.1	71.7	26.2
Managers and administrators, except farm	25.4	54.5	20.1	15.3	59.8	24.8	10.9	62.0	27.1
Bank officials and financial managers	6.1	58.2	35.7	2.5	50.6	46.9	2.1	45.4	52.5
Buyers and shippers, farm products	40.3	51.4	8.3	24.9	64.7	10.4	17.2	71.4	11.4
Buyers, wholesale, and retail trade	21.6	61.2	17.2	15.5	67.1	17.4	12.5	70.0	17.5
Managers and administrators, n.e.c.	25.6	53.6	20.8	15.9	58.8	25.3	11.1	61.4	27.5
Managers and superintendents, building	36.8	50.7	12.5	19.7	62.9	17.4	11.2	69.0	19.7
Restaurant, cafeteria, and bar managers	39.8	53.5	6.7	20.7	70.1	9.2	15.7	73.8	10.5
Sales managers and department heads, retail	23.0	63.5	13.5	16.5	69.8	13.7	13.3	72.9	13.8
Salesworkers	29.5	58.2	12.2	21.4	64.7	13.9	16.1	68.7	15.2
Insurance agents, brokers, and underwriters	12.5	62.9	24.6	4.1	68.2	27.7	2.6	68.2	29.2
Real estate agents and brokers	16.9	62.4	20.7	8.9	71.1	20.0	4.9	75.4	19.7
Sales representatives, manufacturing	15.7	57.2	27.1	8.3	59.4	32.3	4.6	60.5	34.9
Sales representatives, wholesale	21.5	61.8	16.7	12.6	68.7	18.7	8.2	72.1	19.7
Salesclerks, retail trade	40.3	56.0	3.7	31.2	64.3	4.5	26.7	68.4	4.9
Salesworkers, retail trade	31.9	61.6	6.5	20.4	71.7	7.9	14.6	76.8	8.6
Salespeople, service and construction	26.3	59.7	14.0	15.1	68.6	16.3	4.5	78.0	17.5
Stock and bond sales agents	7.5	39.3	53.2	2.8	31.9	65.3	0.5	28.2	71.3
Clerical and kindred workers	16.4	78.6	5.0	10.5	83.9	5.6	8.1	86.2	5.7
Billing clerks	17.5	80.1	2.4	6.5	90.7	2.8	4.5	92.4	3.1
Bookkeepers	16.3	78.4	5.3	11.5	81.7	6.8	9.1	83.3	7.6
Bookkeeping and billing machine operators	15.6	82.4	2.0	5.8	92.0	2.2	4.0	93.7	2.3
Calculating machine operators	20.8	77.4	1.8	8.0	89.9	2.1	5.5	92.2	2.3

Table C-14 (Continued)

Occupation	Percent Distribution of Employment								
	1970			1980			1985		
	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More
Computer and peripheral equipment operators	8.6%	86.5%	4.9%	3.0%	91.8%	5.2%	2.0%	92.6%	5.4%
Insurance adjustors, examiners, and investigators	6.5	58.4	35.1	2.7	61.7	35.6	3.2	61.9	35.9
Keypunch operators	13.8	84.6	1.6	6.2	92.0	1.8	2.8	95.3	1.9
Miscellaneous clerical workers	20.7	70.4	8.9	8.0	81.5	10.5	5.5	83.2	11.3
Office machine operators, n.e.c.	30.7	66.8	2.5	12.8	84.0	3.2	9.1	87.3	3.6
Payroll and timekeeping clerks	18.0	78.7	3.3	9.9	87.0	3.1	7.7	89.3	3.0
Real estate appraisers	8.0	53.2	38.8	4.1	59.2	36.7	1.0	63.0	36.0
Secretaries, legal, medical and other	8.4	86.3	5.3	6.0	89.2	4.8	5.1	90.5	4.4
Shipping and receiving clerks	47.0	51.3	1.7	38.0	59.7	2.3	33.5	63.9	2.6
Statistical clerks	18.4	74.5	7.1	6.9	84.9	8.2	4.7	86.5	8.8
Stenographers	7.4	89.3	3.3	4.1	92.5	3.5	2.5	93.9	3.6
Stock clerks and storekeepers	39.7	57.5	2.8	29.2	67.0	3.8	24.0	71.7	4.3
Tabulating machine operators	17.8	79.8	2.4	6.7	90.5	2.8	4.6	92.4	3.0
Typists	14.4	83.0	2.6	9.4	87.4	3.2	6.9	89.6	3.5
Craftsmen and kindred workers	49.6	48.5	1.9	37.6	60.1	2.3	32.3	65.2	2.5
Air conditioning, heating and refrigeration mechanics	47.9	50.8	1.3	36.2	62.1	1.7	30.4	67.7	1.9
Aircraft mechanics and repairers	30.9	67.5	1.6	20.1	78.2	1.7	14.7	83.5	1.8
Auto body repairers	59.1	40.4	0.5	47.9	51.7	0.4	42.3	57.3	0.4
Auto mechanics	57.1	42.2	0.7	43.4	55.6	1.0	36.6	62.3	1.1
Brickmasons and stonemasons	62.6	36.5	0.9	52.0	46.8	1.2	46.7	52.0	1.3
Bulldozer operators	69.7	29.8	0.5	58.3	41.3	0.4	52.6	47.1	0.3
Cabinetmakers	59.7	38.6	1.7	52.7	44.9	2.4	49.2	48.1	2.7
Carpenters	60.4	38.5	1.1	48.0	50.6	1.4	41.8	56.6	1.6
Carpenter apprentices	24.2	75.8	0.0	11.8	88.1	0.1	8.8	91.0	0.2
Crane, derrick and hoist operators	66.3	33.3	0.4	53.8	45.7	0.5	47.4	51.9	0.6
Data processing machine repairers	6.1	88.5	5.4	7.0	75.8	17.2	4.5	77.5	18.0
Decorators and window dressers	29.0	63.0	8.0	22.5	69.5	8.0	19.3	72.7	8.0
Electricians	36.5	62.1	1.4	26.0	72.3	1.7	20.8	77.4	1.8
Electric power line and cable workers	11.5	83.0	5.5	6.7	87.2	6.1	4.3	89.3	6.4
Excavating, grading, and road machine operators	67.5	32.0	0.5	62.5	37.0	0.5	60.0	39.5	0.5
Farm implement mechanics and repairers	53.6	45.4	1.0	39.9	58.7	1.4	33.1	65.3	1.1
Foremen	40.7	53.2	6.1	26.5	65.9	7.6	21.9	69.7	8.4
Heavy equipment mechanics, including diesel	54.0	45.3	0.7	40.3	58.7	1.0	33.5	65.4	1.1
Job and die setters, metal	59.7	39.7	0.6	47.3	51.9	0.8	41.1	58.0	0.9
Machinists	46.3	52.9	0.8	36.0	63.1	0.9	30.9	68.2	0.9
Machinist apprentices	23.1	76.5	0.4	17.4	81.9	0.7	14.6	84.6	0.8
Miscellaneous mechanics and repairers	43.0	55.3	1.7	32.0	66.3	1.7	26.5	71.8	1.7
Painter apprentices	45.2	54.8	0.0	37.2	62.8	0.0	33.6	66.4	0.0
Painters, construction and maintenance	66.7	32.1	1.2	57.3	41.4	1.3	52.6	46.0	1.4

Table C-14 (Continued)

Occupation	1970 Less Than 12 Years	1970 12-15 Years	1970 16 Years or More	1980 Less Than 12 Years	1980 12-15 Years	1980 16 Years or More	1985 Less Than 12 Years	1985 12-15 Years	1985 16 Years or More
	Percent Distribution of Employment								
Paperhangers	62.3%	35.0%	2.7%	52.7%	44.4%	2.9%	47.9%	49.1%	3.0%
Pattern and model makers, except paper	36.9	61.6	1.5	24.7	73.7	1.6	18.6	79.7	1.7
Photoengravers and lithographers	29.2	67.9	2.9	20.3	77.0	2.7	17.2	80.2	2.6
Plumbers and pipefitters	50.8	48.1	1.1	34.7	63.6	1.7	29.2	68.8	2.0
Printing press apprentices	25.6	73.7	0.7	18.1	81.0	0.9	14.3	84.7	1.0
Printing press operators	39.2	59.7	1.1	27.8	70.6	1.6	23.7	74.5	1.8
Printing trades apprentices, except print pressmen	25.6	74.0	0.4	17.2	82.6	0.2	14.4	55.4	0.2
Radio and T.V. repairers	32.4	65.3	2.3	23.1	74.8	2.1	18.5	79.5	2.0
Sheetmetal apprentices	17.3	82.7	0.0	7.1	92.9	0.0	5.0	95.0	0.0
Sheetmetal workers and tinsmiths	46.9	52.3	0.8	35.8	63.3	0.9	31.5	67.6	0.9
Structural metal craftsmen	54.0	45.1	0.9	38.8	59.9	1.2	31.2	67.3	1.4
Telephone installers and repairers	18.2	81.4	0.4	10.9	88.9	0.2	7.2	92.6	0.2
Telephone linemen and splicers	14.7	84.2	1.1	8.7	90.4	0.9	5.7	93.5	0.8
Tilesetters	59.7	39.5	0.8	47.1	51.7	1.2	40.9	57.8	1.3
Upholsterers	64.7	34.6	0.7	55.4	43.8	0.8	50.8	48.4	0.8
Operatives	59.5	39.8	0.7	49.1	50.0	0.9	44.0	55.0	1.0
Assemblers	53.0	46.4	0.6	43.0	56.3	0.7	58.0	61.2	0.8
Bus drivers	53.0	45.8	1.2	40.0	58.4	1.6	33.5	64.7	1.8
Checkers, examiners, and inspectors, manufacturing	48.9	49.6	1.5	39.2	59.1	1.7	35.3	62.9	1.8
Cutting operatives, n.e.c.	64.3	35.1	0.6	50.2	49.0	0.8	43.1	56.0	0.9
Delivery and route workers	51.4	47.6	1.0	4.4	57.6	1.0	36.4	62.6	1.0
Dressmakers and seamstresses, except factory	60.2	37.9	1.9	50.3	47.3	2.4	45.3	52.0	2.7
Drill press operatives	58.4	41.2	0.4	45.5	53.9	0.6	39.1	60.3	0.6
Graders and sorters, manufacturing	67.3	32.1	0.6	53.8	45.3	0.9	47.1	51.9	1.0
Grinding machine operatives	57.0	42.4	0.6	43.4	55.8	0.8	38.2	60.9	0.9
Lathe and milling machine operatives	49.2	50.1	0.7	38.4	60.7	0.9	33.0	66.0	1.0
Painters, manufactured articles	65.2	34.2	0.6	60.7	38.7	0.6	58.6	40.8	0.6
Other precision machine operatives	53.1	46.4	0.5	37.1	62.3	0.6	29.1	70.2	0.7
Punch and stamping press operatives	61.8	37.8	0.4	49.5	50.0	0.5	43.4	56.1	0.5
Sawyers	73.3	26.2	0.5	62.2	37.1	0.7	56.6	42.6	0.8
Sewers and stitchers	70.3	29.3	0.4	61.4	38.1	0.5	57.0	42.5	0.5
Solderers	58.8	40.6	0.6	45.5	53.8	0.7	38.9	60.4	0.8
Truck drivers	66.3	33.1	0.6	56.5	42.6	0.9	51.6	47.3	1.1
Welders and flame cutters	59.6	40.0	0.4	48.7	50.8	0.5	43.3	56.2	0.5
Service workers	46.5	51.5	2.0	34.7	63.0	2.3	29.5	68.1	2.4
Bartenders	50.5	46.3	3.2	34.4	60.9	4.7	28.9	65.6	5.5
Cooks, except private household	66.1	33.1	0.8	59.8	39.3	0.9	56.7	42.4	0.9
Childcare workers, except private household	48.4	47.7	3.9	39.0	56.4	4.6	34.3	60.8	4.9
Crossing guards and bridge tenders	59.6	39.5	0.9	47.6	51.6	0.8	41.6	57.6	0.8

Table C-14 (Continued)

Occupation	Percent Distribution of Employment								
	1970			1980			1985		
	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More
Firefighters	26.8%	71.8%	1.4%	15.5%	82.9%	1.6%	9.9%	88.4%	1.7%
Food service workers, n.e.c., except private household	64.0	35.1	0.9	57.6	41.4	1.0	54.4	44.5	1.1
Hairdressers and cosmetologists	33.6	65.8	0.6	24.0	75.4	0.6	19.2	80.2	0.6
Health aides, except nursing	38.0	57.7	4.3	27.2	69.1	3.7	22.3	74.1	3.6
Housekeepers, except private household	43.4	50.9	5.8	23.2	68.6	8.2	17.0	74.9	8.1
Marshals and constables	42.3	52.7	5.0	24.5	67.6	7.9	19.3	71.3	9.4
Nursing aides, orderlies and attendants	51.0	47.8	1.2	38.6	60.3	1.1	32.4	66.5	1.1
Police and detectives	20.1	73.8	6.1	9.3	83.4	7.3	6.8	85.3	7.9
Practical nurses	29.9	69.1	1.0	15.3	84.0	0.7	11.6	87.8	0.6
School monitors	29.6	66.4	3.9	22.5	72.9	4.6	18.9	76.2	4.9
Sheriffs and bailiffs	32.0	63.8	4.2	17.6	78.3	4.1	10.4	85.5	4.1
Laborers, except farm	71.2	27.4	1.5	62.2	35.8	2.0	57.9	39.4	2.2
Carpenter helpers	71.1	28.0	0.9	57.8	41.1	1.1	51.2	47.5	1.3
Gardeners and groundskeepers, except farm	71.2	27.2	1.6	62.9	35.0	2.1	58.8	38.9	2.3
Farm occupations	64.1	33.1	2.8	51.0	44.9	4.1	44.1	51.1	4.8
Farm foremen	58.5	35.3	6.2	46.2	46.1	7.7	40.1	51.5	8.4
Farm managers	44.7	43.9	11.4	36.6	53.3	10.1	32.6	58.0	9.4
Farm laborers, wage workers	78.3	20.6	1.1	70.7	27.7	1.6	66.9	31.2	1.9
Farmers, owners and tenants	57.0	39.5	3.5	41.9	53.1	5.0	34.3	59.9	5.8
Total, All Occupations Studied	38.5	54.8	6.7	27.5	63.9	8.6	22.8	68.1	9.1
Total, All U.S. Occupations	37.2%	50.4%	12.4%	27.3%	56.3%	16.4%	23.6%	57.4%	19.0%

Sources: U.S. Department of Labor; 1970 Census of Population; The Conference Board.

Table C-15

Percent Distribution of Employment by Level of Educational Attainment,
16-34 Year Olds, 1970 and Projected 1980 and 1985, Occupations Included in Study

Occupation	1970			1980			1985		
	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More
Professional, technical, and kindred workers									
Computer programmers	1.1%	56.1%	42.8%	1.0%	48.5%	50.5%	0.9%	44.7%	54.4%
Designers	6.7	59.2	34.1	4.7	60.6	34.7	3.6	61.4	35.0
Drafters	8.6	86.8	4.6	7.3	91.0	1.7	6.7	92.3	1.0
Electrical and electronic engineering technicians	5.9	89.3	4.8	2.6	93.0	4.4	1.4	94.5	4.1
Engineering and science technicians, n.e.c.	8.0	78.6	13.4	3.6	83.8	12.6	2.0	86.4	11.6
Mechanical engineering technicians	12.6	69.3	18.1	5.9	76.5	17.6	3.4	79.6	17.0
Other technicians, except health	16.7	69.8	13.5	8.0	78.6	13.4	4.5	82.4	13.1
Personnel and labor relations workers	5.0	48.3	46.7	4.5	50.5	45.0	4.3	51.7	44.0
Recreation workers	16.1	53.7	30.2	18.8	54.1	27.1	20.3	54.5	25.2
Registered nurses	3.9	78.0	18.1	2.0	76.5	21.5	1.2	75.5	23.3
Therapists	3.6	31.5	64.9	2.0	44.5	53.5	0.5	51.6	47.9
Tool programmers, numerical control	1.5	68.4	30.1	0.7	71.6	27.7	0.4	73.3	26.3
Managers and administrators, except farm									
Bank officials and financial managers	2.6	60.6	36.8	1.1	50.2	48.7	1.0	47.1	51.9
Buyers and shippers, farm products	17.2	66.2	16.6	9.0	55.2	35.8	5.7	47.1	48.2
Buyers, wholesale, and retail trade	9.2	64.7	26.1	6.8	71.7	21.5	5.6	75.2	19.2
Managers and administrators, n.e.c.	15.0	63.2	21.8	9.8	71.5	18.7	7.1	76.6	16.3
Managers and superintendents, building	21.2	59.6	19.2	7.2	66.1	26.7	2.9	67.2	29.9
Restaurant, cafeteria, and bar managers	25.5	66.3	8.2	11.9	77.9	10.2	6.1	81.4	12.5
Sales managers and department heads, retail	15.1	69.3	15.6	10.8	73.9	15.3	9.0	78.5	12.5
Salesworkers									
Insurance agents, brokers, and underwriters	6.2	68.3	25.5	2.1	76.7	21.2	1.3	79.8	18.9
Real estate agents and brokers	9.8	64.0	26.2	7.6	79.4	13.0	4.9	88.3	6.8
Sales representatives, manufacturing	9.0	58.6	32.4	4.6	58.3	37.1	2.5	58.2	39.3
Sales representatives, wholesale	12.8	66.3	20.9	7.2	70.4	22.4	4.6	72.3	23.1
Salesclerks, retail trade	35.8	60.5	3.7	29.2	67.1	3.7	25.8	70.6	3.6
Salesworkers, retail trade	22.5	69.0	8.5	13.6	79.0	7.4	8.5	75.2	16.3
Salespeople, service and construction	24.7	60.5	14.8	14.1	68.9	17.0	10.0	83.2	6.8
Stock and bond sales agents	3.6	34.7	61.7	1.0	38.6	60.4	0.1	17.8	82.1
Clerical and kindred workers									
Billing clerks	10.9	86.9	2.2	3.4	93.8	2.8	2.1	94.6	3.3
Bookkeepers	10.1	84.8	5.1	6.6	85.8	7.6	5.0	85.9	9.1
Bookkeeping and billing machine operators	10.5	88.0	1.5	3.3	94.8	1.9	2.1	95.8	2.1
Calculating machine operators	11.3	86.1	2.6	3.5	93.2	3.3	2.3	95.9	1.8
Computer and peripheral equipment operators	5.8	89.8	4.4	1.7	93.1	5.2	1.0	93.3	5.3

Table C-15 (Continued)

Occupation	1970			1980			1985		
	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More	Less Than 12 Years	12-15 Years	16 Years or More
Insurance adjustors, examiners, and investigators	3.7%	54.5%	41.8%	2.0%	55.0%	43.0%	1.8%	54.2%	44.0%
Keypunch operators	10.7	87.9	1.4	3.3	94.9	1.8	1.8	96.3	1.9
Miscellaneous clerical workers	14.1	77.5	8.4	4.4	84.9	10.7	2.7	85.2	12.1
Office machine operators, n.e.c.	20.2	77.3	2.5	6.7	89.9	3.4	4.3	91.7	4.0
Payroll and timekeeping clerks	9.9	86.6	3.5	5.1	90.7	4.2	3.8	91.6	4.6
Real estate appraisers	2.6	52.9	44.5	0.3	58.1	41.6	0.3	60.0	39.7
Secretaries, legal, medical and other	6.3	89.0	4.7	4.8	91.6	3.6	4.2	92.8	3.0
Shipping and receiving clerks	23.4	74.7	1.9	17.4	80.2	2.4	14.8	82.6	2.6
Statistical clerks	9.3	82.6	8.1	2.8	87.3	9.9	1.7	87.2	11.1
Stenographers	4.0	93.8	2.2	2.0	96.1	1.9	1.1	97.2	1.7
Stock clerks and storekeepers	32.3	64.3	3.4	19.5	75.2	5.2	14.1	79.8	6.1
Tabulating machine operators	12.9	85.3	1.8	4.0	93.7	2.3	2.5	94.9	2.6
Typists	12.2	85.1	2.7	10.3	85.9	3.8	8.2	87.5	4.3
Craftsmen and kindred workers									
Air conditioning, heating and refrigeration mechanics	36.3	62.3	1.4	25.7	72.6	1.7	20.9	77.3	1.8
Aircraft mechanics and repairers	16.3	82.8	0.9	6.3	92.6	1.1	3.0	95.8	1.2
Auto body repairers	49.1	50.3	0.6	40.0	59.1	0.9	35.7	63.2	1.1
Auto mechanics	45.0	54.2	0.8	30.7	68.0	1.3	24.4	74.1	1.5
Brickmasons and stonemasons	50.8	48.5	0.7	43.9	56.0	0.1	40.8	58.7	0.5
Bulldozer operators	56.1	43.8	0.1	48.4	51.5	0.1	45.3	54.6	0.1
Cabinetmakers	45.0	53.7	1.3	34.4	62.0	3.6	29.4	65.5	5.1
Carpenters	35.1	63.4	1.5	19.8	78.3	1.9	16.1	81.9	2.0
Carpenter apprentices	23.4	76.6	0.0	11.3	88.6	0.1	8.4	91.4	0.2
Crane, derrick and hoist operators	48.4	51.1	0.5	35.6	63.9	0.4	30.1	69.6	0.3
Data processing machine repairers	3.9	91.8	4.3	1.7	94.5	3.8	0.9	95.6	3.5
Decorators and window dressers	22.8	67.5	9.7	17.7	72.4	9.9	15.2	74.8	10.0
Electricians	22.0	76.7	1.3	12.6	85.4	2.0	8.8	88.8	2.4
Electric power line and cable workers	22.6	76.8	0.6	11.1	87.9	1.0	8.6	90.2	1.2
Excavating, grading, and road machine operators	51.4	47.7	0.9	44.0	55.6	0.4	40.4	59.4	0.2
Farm implement mechanics and repairers	37.0	62.0	1.0	24.1	74.4	1.5	18.6	79.6	1.8
Foremen	27.4	64.5	8.1	17.0	75.1	7.9	14.0	78.4	7.6
Heavy equipment mechanics, including diesel	36.4	62.8	0.8	30.7	67.9	1.4	27.9	70.3	1.8
Job and die setters, metal	39.7	59.9	0.4	21.6	78.0	0.4	17.6	81.9	0.5
Machinists	30.2	69.1	0.7	19.9	79.4	0.7	15.4	83.9	0.7
Machinist apprentices	20.5	79.1	0.4	13.4	85.9	0.7	10.3	88.9	0.8
Miscellaneous mechanics and repairers	32.6	66.5	0.9	17.2	81.9	0.9	11.1	88.1	0.8
Painter apprentices	45.8	54.2	0.0	37.0	63.0	0.0	33.0	67.1	0.0
Painters, construction and maintenance	56.2	42.5	1.3	48.1	50.6	1.3	44.4	54.2	1.4
Paperhangers	50.9	49.1	0.0	42.7	57.3	0.0	38.9	61.1	0.0
Pattern and model makers, except paper	20.6	77.7	1.7	11.1	86.5	2.4	7.3	89.8	2.9

Table C-15 (Continued)

Occupation	1970 Less Than 12 Years	1970 12-15 Years	1970 16 Years or More	1980 Less Than 12 Years	1980 12-15 Years	1980 16 Years or More	1985 Less Than 12 Years	1985 12-15 Years	1985 16 Years or More
Photoengravers and lithographers	14.7%	83.3%	2.0%	4.7%	92.7%	2.6%	1.8%	95.3%	2.9%
Plumbers and pipefitters	32.3	67.3	0.4	18.8	80.6	0.6	14.7	84.6	0.7
Printing press apprentices	25.3	73.9	0.8	11.8	88.0	0.2	8.5	91.4	0.1
Printing press operators	28.6	70.5	0.9	19.5	79.6	0.9	17.2	81.9	0.9
Printing trades apprentices, except print pressmen	24.1	75.5	0.4	11.8	88.2	0.0	8.7	91.3	0.0
Radio and T.V. repairers	28.8	69.5	1.7	23.1	75.7	1.2	18.5	80.7	0.8
Sheetmetal apprentices	16.9	83.1	0.0	7.0	93.0	0.0	4.8	95.2	0.0
Sheetmetal workers and tinsmiths	43.1	55.9	1,0	38.8	59.4	1.8	38.0	59.5	2.5
Structural metal craftsmen	39.2	60.0	0.8	23.6	75.6	0.8	17.0	82.2	0.8
Telephone installers and repairers	11.5	88.2	0.3	4.9	94.9	0.2	3.5	94.6	1.9
Telephone linemen and splicers	9.6	89.4	1.0	3.4	96.1	0.5	1.0	99.7	0.4
Tilesetters	51.1	48.3	0.6	44.1	55.8	0.1	39.8	59.3	0.9
Upholsterers	56.4	43.3	0.3	43.6	55.7	0.7	37.6	61.6	0.8
Operatives									
Assemblers	40.7	58.8	0.5	29.7	69.7	0.6	24.7	74.6	0.7
Bus drivers	39.1	59.0	1.9	25.4	71.5	3.1	20.4	76.2	3.4
Checkers, examiners, and inspectors, manufacturing	32.6	65.7	1.7	19.7	78.3	2.0	15.1	82.2	2.7
Cutting operatives, n.e.c.	50.3	49.1	0.6	27.0	71.8	1.2	17.7	80.8	1.5
Delivery and route workers	41.2	57.8	1.0	27.5	71.4	1.1	21.4	77.4	1.2
Dressmakers and seamstresses, except factory	45.6	49.0	5.4	36.0	57.6	6.4	31.5	61.5	7.0
Drill press operatives	44.3	55.2	0.5	22.3	76.8	0.9	13.9	85.9	1.2
Graders and sorters, manufacturing	55.4	43.7	0.9	33.7	64.6	1.7	35.3	63.4	1.3
Grinding machine operatives	40.4	59.0	0.6	21.3	77.2	1.5	13.9	84.0	2.1
Lathe and milling machine operatives	32.8	66.4	0.8	16.6	82.0	1.4	10.6	87.3	2.1
Painters, manufactured articles	55.3	44.4	0.3	51.5	48.3	0.2	53.0	46.8	0.2
Other precision machine operatives	34.4	65.0	0.6	19.9	79.8	0.3	13.9	85.4	0.7
Punch and stamping press operatives	46.1	53.5	0.4	24.8	74.3	0.9	17.9	80.8	1.3
Sawyers	55.5	44.2	0.3	36.2	63.0	0.8	16.3	82.7	1.1
Sewers and stitchers	56.9	42.9	0.2	44.8	54.9	0.3	39.2	60.5	0.3
Solderers	43.6	55.8	0.6	28.3	71.0	0.7	20.3	72.3	7.4
Truck drivers	42.7	56.5	0.7	20.1	28.9	1.1	17.1	81.6	1.2
Welders and flame cutters	46.7	52.9	0.4	33.0	66.5	0.5	26.8	72.7	0.5
Service workers									
Bartenders	30.4	60.7	5.9	20.6	67.5	11.9	17.4	66.6	15.9
Cooks, except private household	62.6	36.2	1.2	56.1	42.6	1.3	52.9	45.8	1.3
Childcare workers, except private household	40.0	55.5	4.5	30.1	63.7	6.2	26.5	66.2	7.3
Crossing guards and bridge tenders	36.9	61.1	2.0	28.5	69.5	2.0	24.9	73.0	2.1
Firefighters	19.5	79.4	1.1	11.9	87.5	0.6	7.9	91.8	0.3
Food service workers, n.e.c., except private household	62.4	36.6	1.0	55.9	43.0	1.1	52.7	46.2	1.1
Hairdressers and cosmetologists	23.2	76.3	0.5	14.1	85.4	0.5	10.2	19.3	0.5

Table C-15(Continued)

Occupation	1970 Less Than 12 Years	1970 12-15 Years	1970 16 Years or More	1980 Less Than 12 Years	1980 12-15 Years	1980 16 Years or More	1985 Less Than 12 Years	1985 12-15 Years	1985 16 Years or More
Health aides, except nursing	30.4%	64.7%	4.9%	21.8%	72.7%	5.5%	17.8%	76.7%	5.5%
Housekeepers, except private household	27.2	61.4	11.4	12.8	73.0	14.2	9.1	77.3	13.6
Marshals and constables	10.5	79.9	9.6	5.8	79.8	14.4	4.8	77.3	17.9
Nursing aides, orderlies and attendants	39.6	58.9	1.5	36.7	62.0	1.3	34.8	63.9	1.3
Police and detectives	10.6	84.2	5.2	4.1	90.2	5.7	2.7	91.3	6.0
Practical nurses	11.3	87.9	0.8	4.2	95.2	0.6	1.0	88.5	0.5
School monitors	15.6	80.6	3.8	10.8	84.5	4.7	9.2	85.3	5.5
Sheriffs and bailiffs	12.7	82.7	4.5	10.0	85.0	5.0	1.0	87.4	5.5
Laborers, except farm									
Carpenter helpers	58.5	40.2	1.3	42.9	54.8	2.3	36.0	61.2	2.8
Gardeners and groundskeepers, except farm	72.2	26.2	1.6	64.0	34.0	2.0	59.9	37.9	2.2
Farm occupations									
Farm foremen	38.2	47.3	14.5	26.7	52.3	21.0	21.8	53.5	24.7
Farm managers	24.0	60.8	15.2	10.4	76.8	12.8	5.0	83.6	11.4
Farm laborers, wage workers	70.0	28.6	1.4	56.1	41.3	2.6	47.6	49.0	3.4
Farmers, owners and tenants	27.6	66.7	5.7	12.3	78.9	8.8	6.8	82.6	10.6

Sources: 1970 Census of Population; The Conference Board.

Table C-16

Vocational Programs Related to Occupations Included in Conference Board Study

Occupation - BLS Title	Related Vocational Programs
Buyers and shippers, farm products Farmers, owners and tenants Farm managers Farm foremen Farm laborers, wage workers	Agricultural production
Gardeners, except farm and groundskeepers	Landscaping
Bank officials and financial managers Stock and bond sales agents	Finance and credit
Delivery and route workers	Food distribution
Sales managers and department heads, retail Buyers, wholesale, and retail trade Restaurant, cafeteria, and bar managers Salesclerks, retail trade Salesworkers, retail trade Salespeople, service and construction Managers and administrators, n.e.c.	General merchandise Apparel and accessories
Sales representatives, manufacturing Sales representatives, wholesale	Industrial marketing Hardware, building materials, farm and garden supplies and equipment
Insurance agents, brokers, and underwriters Insurance adjustors, examiners, and investigators	Insurance

Table C-16 (Continued)

Occupation - BLS Title	Related Vocational Programs
Managers and superintendents, building Real estate agents and brokers Real estate appraisers	Real estate
Recreation workers	Recreation and tourism
Bus drivers	Transportation
Registered nurses	Nursing (associate degree)
Practical nurses	Practical (vocational) nurses
Nursing aides, orderlies and attendants	Nursing assistance (aide)
Therapists	Occupational therapy Inhalation therapy Physical therapy Psychiatric aide
Health aides, except nursing	Medical assistant (physician's office)
Childcare workers, except private household School monitors	Care and guidance of children
Dressmakers and seamstresses, except factory Sewers and stitchers	Dressmaking Clothing management production and service Home furnishings equipment and service
Restaurant, cafeteria, and bar managers Housekeepers, except private household	Food management production and service
Bookkeepers	Bookkeepers

Table C-16 (Continued)

Occupation - BLS Title	Related Vocational Programs
Bookkeeping and billing machine operators Calculating machine operators Tabulating machine operators Payroll and timekeeping clerks	Machine operators (billing, bookkeeping and computing)
Computer and peripheral equipment operators	Computer and console operators
Computer programmers	Programmers Scientific data processors
Keypunch operators	Keypunch and coding equipment operators
Billing clerks Office machine operators, n.e.c. Miscellaneous clerical workers Payroll and timekeeping clerks Statistical clerks Bookkeeping and billing machine operators	General office clerks Filing, office machine, and general office clerks, other
Shipping and receiving clerks Graders and sorters, manufacturing	Shipping and receiving clerks
Stock clerks and storekeepers	Stock and inventory clerks
Personnel and labor relations workers	Interview and test technicians Personnel assistants
Secretaries, legal, medical and other	Secretary
Stenographers	Stenographer

Table C-16 (Continued)

Occupation - BLS Title	Related Vocational Programs
Typists	Clerk typist Typist
Electrical and electronic engineering technicians Other technicians, except health Data processing machine repairers Radio and T.V. repairers	Electrical technology Electronic technology
Mechanical engineering technicians Engineering and science technicians, n.e.c. Tool programmers, numerical control	Mechanical technology
Air conditioning, heating and refrigeration mechanics	Air conditioning Cooling Heating
Auto body repairers Painters, manufactured articles	Body and fender
Foremen	Foremanship, supervision, and management development
Printing trades apprentices, except printing press Printing press operators Printing press apprentices	Printing press occupations
Photoengravers and lithographers	Photoengraving Lithography, photography, and platemaking

Table C-16 (Continued)

Occupation - BLS Title	Related Vocational Programs
Job and die setters, metal	Machine shop
Machinists	
Machinist apprentices	
Pattern and model makers, except paper	
Other precision machine operatives	
Cutting operatives, n.e.c.	Machine tool operation
Drill press operatives	
Grinding machine operatives	
Lathe and milling machine operatives	
Other precision machine operatives	
Punch and stamping press operatives	
Sawyers	
Job and die setters, metal	Metal trades combined
Structural metal crafts workers	
Punch and stamping press operatives	
Sheetmetal workers and tinsmiths	Sheetmetal
Sheetmetal apprentices	
Welders and flame cutters	Electric welding Combination welding
Solderers	Brazing and soldering
Hairdressers and cosmetologists	Cosmetology
Auto mechanics	Mechanics
Farm implement mechanics and repairers	Agricultural power and machinery
Heavy equipment mechanics, including diesel	

Table C-16 (Continued)

Occupation - BLS Title	Related Vocational Programs
Aircraft mechanics and repairers	Aircraft maintenance
Designers Decorators and window dressers	Interior decorating
Carpenters Carpenter helpers Carpenter apprentices	Carpentry
Electricians	Electricity Electrical occupations
Bulldozer operators Excavating, grading, and road machine operators Crane, derrick and hoist operators	Operation, heavy equipment
Brickmasons and stonemasons Tilesetters	Masonry
Painters, construction and maintenance Paperhangers Painter apprentices	Painting and decorating
Plumbers and pipefitters	Plumbers and pipefitters
Drafters	Drafting
Telephone line and splicing workers Electric power line and cable workers	Industrial electrician Linemen
Telephone installers and repairers	Communications

Table C-16 (Continued)

Occupation - BLS Title	Related Vocational Programs
Radio and T.V. repairers	Radio and T.V.
Firefighters	Fireman training
Crossing guards and bridge tenders Marshals and constables Police and detectives Sheriffs and bailiffs	Law enforcement training Police science technology
Cooks, except private household Food service workers, n.e.c., except private household	Cook/Chef
Miscellaneous mechanics and repairers	Small engine repair
Upholsterers	Upholstering
Cabinetmakers Sawyers	Woodworking
Assemblers	No related program
Checkers, examiners, and inspectors, manufacturing	No related program
Truck drivers	No related program
Bartenders	No related program

Source: U.S. Department of Labor, Bureau of Labor Statistics, "Matching 1970 Census Based BLS National-State Matrix Occupational Categories to Office of Education Instructional Programs," 1974, unpublished.

Table C-17

Enrollment in Vocational Programs Per 100 Persons Employed in Related Occupations, 1970, and Projected Average Annual Rate of Growth in Enrollment, 1970-77, and Employment, 1970-1980

Vocational Program	Enrollments Per 100 Employed, 1970	Average Annual Growth Rate in Enrollments, 1970-77	Average Annual Growth Rate in Employment, 1970-80
Agricultural production	22	-1.8%	-4.4%
Landscaping	9	7.8	0.2
Finance and credit	4	12.8	4.0
Food distribution	5	1.0	1.7
General merchandise Apparel and accessories	2	15.4	2.8
Hardware and building materials Industrial marketing	1	7.8	2.3
Insurance	3	0.5	2.4
Real estate	12	17.8	3.1
Recreation	5	41.8	4.4
Transportation	5	2.6	2.6
Nursing (associate degree)	4	15.5	3.7
Practical (vocational) nursing	16	9.7	5.6
Nursing assistants (aide)	6	11.4	3.7
Psychiatric aide Occupational therapy Physical therapy Inhalation therapy	4	28.4	6.1
Medical assistants	3	32.2	6.5
Care and guidance of children	8	32.8	3.6
Dressmaking Home furnishings equipment and service Clothing management	8	16.0	1.1
Food management, production and service	9	15.5	2.3

Table C-17 (Continued)

Vocational Program	Enrollments Per 100 Employed, 1970	Average Annual Growth Rate in Enrollments, 1970-77	Average Annual Growth Rate in Employment, 1970-80
Bookkeepers Machine operators	17	6.8%	2.2%
Computer console operators Business data processing Scientific data processing Keypunch and coding equipment operators	29	-0.4	3.7
General office clerks Filing, office machines, general office	35	2.0	3.5
Shipping and receiving clerks Stock and inventory clerks	1	-3.1	1.3
Interviewers and test technicians Personnel assistants	3	15.3	5.3
Secretaries Stenographers	16	6.9	3.6
Clerk typists Typists	57	5.6	2.6
Electrical technicians Electronic technicians	19	6.5	4.0
Mechanical technology	14	1.0	6.2
Air conditioning	22	28.7	5.2
Body and fender	7	28.8	0.8
Mechanics, auto Agricultural mechanics	15	15.8	1.9
Aircraft maintenance	29	1.0	2.9
Interior decorating	11	15.6	3.2
Carpentry	5	19.1	0.9
Electricity Electrical occupations	24	10.7	2.6
Operation, heavy equipment	N.A.	N.A.	1.8

Table C-17 (Continued)

Vocational Program	Enrollments Per 100 Employed, 1970	Average Annual Growth Rate in Enrollments, 1970-77	Average Annual Growth Rate in Employment, 1970-80
Masonry	11	12.5%	1.7%
Painting and decorating	N.A.	N.A.	0.9
Plumbing and pipefitting	8	11.8	2.6
Drafters	35	5.5	3.0
Communications	41	9.2	1.6
Radio and T.V.			
Foremanship	5	18.0	1.3
Printing press operators	30	10.2	1.8
Lithography			
Photoengraving			
Machine shop	10	8.0	1.8
Machine tool operation			
Metal trades combined			
Sheetmetal			
Electrical welding			
Combination welding			
Brazing and soldering			
Cosmetology	8	10.8	2.3
Fireman training	55	17.6	3.6
Law enforcement training	10	16.8	2.5
Cook/Chef	2	17.9	3.7
Small engine repair	8	24.1	1.8
Upholstering	11	27.6	1.8
Woodworking occupations	26	18.7	1.5
Occupations With No Related Vocational Program			
Assemblers	-0-	N.A.	1.2
Checkers, examiners, and inspectors, manufacturing	-0-	N.A.	1.6

Table C- 17 (Continued)

Occupations With No Related Vocational Program	Enrollments Per 100 Employed, 1970	Average Annual Growth Rate in Enrollments, 1970-77	Average Annual Growth Rate in Employment, 1970-80
Truck drivers	-0-	N.A.	1.4%
Bartenders	-0-	N.A.	1.6
Total, All Vocational Programs and Occupations Included in Study	11	9.2%	2.1%

Sources: Enrollment data--U.S. Office of Education; Employment data--U.S. Department of Labor, Bureau of Labor Statistics.